Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy											Date: May 2017	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603502N *I Surface & Shallow Water MCM*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	1,212.939	88.092	165.775	154.117	-	154.117	233.873	249.795	257.289	274.909	Continuing	Continuing
0530: *Mine Hunt Systems*	270.881	9.558	9.851	9.761	-	9.761	8.896	8.279	6.869	4.529	Continuing	Continuing
1233: *Surface MCM Mid-life Upgrade*	150.090	6.136	4.237	0.000	-	0.000	0.000	1.021	1.042	1.065	Continuing	Continuing
1234: *Unmanned Surface Vehicle (USV)*	23.259	22.962	43.412	23.594	-	23.594	22.106	16.238	20.052	19.860	Continuing	Continuing
1235: *Mine Warfare Planning and Analysis*	0.000	7.520	8.910	3.139	-	3.139	9.359	8.635	7.043	7.184	Continuing	Continuing
2094.: *Unmanned Underwater Vehicle*	52.964	11.896	67.607	60.187	-	60.187	122.167	139.433	149.242	162.623	Continuing	Continuing
2131: *Assault Breaching System*	595.138	15.097	20.201	11.623	-	11.623	20.950	20.673	17.319	17.666	Continuing	Continuing
2989: *Barracuda*	0.000	0.000	0.000	20.761	-	20.761	33.678	34.769	34.124	39.951	Continuing	Continuing
3123: *SMCM UUV*	120.607	14.923	11.557	25.052	-	25.052	16.717	20.747	21.598	22.031	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element provides resources for development of mine countermeasure systems to provide minehunting, minesweeping, and neutralization to counter known and projected mine threats. The mine countermeasures systems provide mobile, quick reaction forces capable of land or sea-based minehunting and minesweeping operations worldwide. Resources are for developing and deploying advanced mine-hunting and minesweeping systems and the intelligence and oceanographic capabilities that will enable mine warfare superiority. Tactics and techniques used vary across a diversity of environments and a diversity of threats, including both asymmetric and emerging. Resources provide for systems and support of mine warfare systems, maritime systems, and expeditionary systems to allow for continuous operations of the Navy's warships and support vessels, other military vessels, and commercial vessels. Core capabilities include forward presence, deterrence, sea control, power projection, maritime security, humanitarian assistance and disaster response to maintain freedom of the seas. Increased capability includes conducting minefield reconnaissance (mine density and location) at high area search rates, improving detection capability, decreasing sensor false alarm rates, reducing or eliminating post-mission analysis detect, classify, identify, decide time, improving neutralization time, improving network communications, automatic target recognition, and achieving in-stride detect-to-engage capability. Concept of operations includes development of cooperative, unmanned, modular systems; the establishment of a capable networked command and control systems; and standing up an accurate and interactive environmental system with the ability to form and disseminate a Common Environmental Picture. Efforts benefit the Mine Countermeasure (MCM) force by transforming the Navy from the platform-centered legacy set of systems to a capability-centered force that is distributed, networked, and able to provide unique maritime influence and access across the entire maritime domain.

The Surface Mine Countermeasures (SMCM) programs are in general platform independent and will provide detection, classification, localization, identification, neutralization, and influence clearance capabilities. Programs develop: (1) Unmanned minehunting capability for surface platforms; (2) the integration and improvement

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 0603502N *I Surface & Shallow Water MCM*

of new and existing systems (3) support for systems which detect, localize, classify, identify, and neutralize all mine types across MCM Avenger Class and other platforms; (4) systems for neutralizing mines and light obstacles through the entire water column to include deep water, open water, shallow water, very shallow water, surf zones, and beach landing craft zones in support of operations; (5) the integration of Unmanned Undersea Vehicles (UUVs) to meet Undersea Surveillance capabilities as well as other prioritized and enduring capabilities, requirements and gaps and (6) integrate hardware for experimental testing related to surface ship, aircraft, and other cross platform applications.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	90.472	165.775	157.821	-	157.821
Current President's Budget	88.092	165.775	154.117	-	154.117
Total Adjustments	-2.380	0.000	-3.704	-	-3.704
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.199	0.000			
• SBIR/STTR Transfer	-2.579	0.000			
• Program Adjustments	0.000	0.000	4.984	-	4.984
• Rate/Misc Adjustments	0.000	0.000	-8.688	-	-8.688

Change Summary Explanation

Program Adjustments:

FY16 -$2,380K Total adjustments; SBIR -$2,579K, +$199K BTR.

FY17 No Change

FY18 -$3,704K Total adjustments: +$4,300K Mines Encapsulated Effector; +$20,400K PE realignment from 0604373N for Barracuda Mine Neutralizer; +$4,300K AQS-20 Fiber 2; +$3,108K AN/AQS-20A integration; -$19,106K LDUUV Restructure; -$8,018K Miscellaneous Realignments; -$8,688K Miscellaneous Reductions

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy										Date: May 2017		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*				Project (Number/Name) 0530 / *Mine Hunt Systems*			
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
0530: *Mine Hunt Systems*	270.881	9.558	9.851	9.761	-	9.761	8.896	8.279	6.869	4.529	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project contains resources for systems, subsystems, and sensors integrated for use with either the Remote Minehunting System (RMS) Remote Multi-Mission Vehicle (RMMV) or the MCM Unmanned Surface Vehicle (MCM USV) for mine detection, classification, localization, identification, neutralization, and influence clearance capabilities. Research, development, test, and evaluation efforts are for increasing capability by decreasing time required to conduct Mine Countermeasures (MCM) operations, ensuring low risk to naval and commercial vessels, and removing the man from the minefield. Increased capability includes conducting minefield reconnaissance (mine density and location) at high area search rates, improving detection capability, decreasing sensor false alarm rates, and reducing post-mission analysis for detection, classification, identification, and neutralization.

The AN/AQS-20 is a mine hunting and identification system with acoustic and optic sensors housed in an underwater towed body. The acoustic sensors are designated for the detection, classification and localization of bottom, close-tethered, and volume targets. The Volume Search Sonar (VSS) on the AQS-20A sonar is removed from the body and replaced with an Electro-Optic ID (EOID) module to conduct identification sorties. The system will be deployed from the Littoral Combat Ship (LCS) as part of the MCM Mission Package. The RMMV or the MCM USV tows the AN/AQS-20.

The AN/AQS-20 Block 1 (the AQS-20A) is undergoing a Pre-Planned Product Improvement (P3I) program to upgrade the Forward Looking Sonar (FLS) and Side-Looking Sonars (SLS) to improve Probability of Classifying a Mine-like object as a Mine, reduce False Classification, and improve Depth Localization performance to meet Block 2 performance. The Forward Looking Sonar will be replaced with a new High Frequency Wideband design (WBFLS). The SLS will be replaced with a new Multi-function SLS with Synthetic Aperture Sonar (SAS) capability, as well as, improved signal processing and Signal to Noise Ratio. The Block 1 P3I program began in FY 2012 and will complete in FY 2017. Award and management for Block 2 production units began in FY 2014 (the AQS-20C). Materiel Reliability, obsolescence, and performance Engineering Change Proposal (ECP) efforts continue beyond FY 2021.

In FY 2017, the AN/AQS-20 Block 2 P3I program will initiate Development Testing (DT) and initiate Synthetic Aperture Sonar (SAS) Acoustic Recognition development and test. The AN/AQS-20 program will also complete the initial build of algorithms and software components to be used for mission analysis software tools for the AN/AQS-20 Block 2 (the AQS-20C). The Block 2 P3I program began in FY 2017 and continues beyond FY21. Development of Depot Maintenance Overhaul and Technical Insertion plans will also occur. Development and Material Reliability, obsolescence, and performance Engineering Change Proposal (ECP) efforts will continue beyond FY20.

In FY 2018, the AN/AQS-20 Block 2 program is scheduled to complete Developmental Testing and initiate the integration of MCM improvements for post mission analysis tools for the Fleet Operators. The net effect of these tools combined with the more powerful AN/AQS-20 Block 2 sensors will be improved classification of mines, more accurate vertical localization, reduced false calls, and improved area clearance rate sustained. Improvements also include the collection and ingestion of in-

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

situ environmental data used for mission planning to configure the sensor which optimizes sensor performance during missions. Development of these tools begins in FY 2018 and will continue through FY 2021.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: AN/AQS-20 Product Development:	3.522	2.900	3.036	0.000	3.036
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Complete Software updates for AN/AQS-20 Block 2 EDMs - Initiate Mission Analysis Software tools for AN/AQS-20 Block 2 (AQS-20C variant).					
FY 2017 Plans: - Initiate SAS Acoustic mine recognition development. - Initiate SAS Acoustic mine recognition ECP. - Complete Mission Analysis Software for AN/AQS-20 Block 2. - Correction of deficiencies identified during testing					
FY 2018 Base Plans: - Continue SAS Acoustic mine recognition development. - Continue SAS Acoustic mine recognition ECP. - Initiate algorithm development for AN/AQS-20 Block 2 PMA Improvements. - Initiate development of the Mission Planning Optimizer used to configure the AN/AQS-20 Block 2 sensors. - Update interfaces used to ingest environmental data into the AN/AQS-20 Block 2 PMA tools. - Correction of deficiencies identified during testing.					
FY 2018 OCO Plans: - N/A					
Title: AN/AQS-20 Support:	2.971	2.300	0.900	0.000	0.900
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Provide ongoing technical engineering support to AN/AQS-20. - Complete updates to logistics products based on the results of LCS MCM MP testing. - Conduct repairs to AN/AQS-20 from LCS MCM MP TECHEVAL. - Conduct test minefield maintenance					
FY 2017 Plans: - Continue to provide ongoing technical engineering support to AN/AQS-20.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Develop Depot Maintenance (Overhaul) Plan. - Continue to conduct test minefield maintenance. - Develop Technical Insertion Plan. ***FY 2018 Base Plans:*** - Provide ongoing technical engineering support to AN/AQS-20. - Continue to conduct test minefield maintenance. - Initiate AN/AQS-20 Block 2 Mission Planning and Post Mission Analysis Concept of Employment development. ***FY 2018 OCO Plans:*** - N/A					
Title: AN/AQS-20 Test and Evaluation	1.765	3.300	5.325	0.000	5.325
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Conduct AN/AQS-20 Block 2 EDM Testing. - Complete AN/AQS-20 Block 2 EDM initial performance analysis. ***FY 2017 Plans:*** - Initiate AN/AQS-20 Block 2 LRIP Developmental Testing (DT). - Conduct SAS Acoustic recognition Testing. ***FY 2018 Base Plans:*** - Complete AN/AQS-20 Block 2 DT. - Conduct AN/AQS-20 Block 2 PMA Data Collection with test mines under various conditions ***FY 2018 OCO Plans:*** - N/A					
Title: AN/AQS-20 Management Services	1.300	1.351	0.500	0.000	0.500
Articles:	-	-	-	-	-
FY 2016 Accomplishments: - Provide planning and management for the AN/AQS-20 program. - Provide Program Office travel support. ***FY 2017 Plans:***					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 0530 / *Mine Hunt Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
- Provide planning and management for the AN/AQS-20 program. - Update acquisition documentation in support of Full Rate Production (FRP) Decision Review and Initial Operational Capability (IOC). - Continue to provide Program Office travel support. ***FY 2018 Base Plans:*** - Provide planning and management for the AN/AQS-20 program. - Continue update of acquisition documentation in support of Full Rate Production (FRP) Decision Review. - Continue to provide Program Office travel support. ***FY 2018 OCO Plans:*** - N/A					
Accomplishments/Planned Programs Subtotals	9.558	9.851	9.761	0.000	9.761

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• OPN 1601: *LCS MCM Mission Modules*	67.451	57.146	55.870	-	55.870	73.903	75.373	158.293	188.844	1,406.438	2,165.302

Remarks

Funding displayed on BLI 1601 OPN in total, does not reflect AQS-20 OPN dollars.

D. Acquisition Strategy

AN/AQS-20 LRIP procurement continues following Block 2 (AQS-20C units) competitive contract award in FY 2014. Continue to meet MCM MP requirements to support production of Block 2 units.

E. Performance Metrics

AN/AQS-20 - Successfully complete Block 2 DT in FY 2018.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1233 / *Surface MCM Mid-life Upgrade*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
1233: *Surface MCM Mid-life Upgrade*	150.090	6.136	4.237	0.000	-	0.000	0.000	1.021	1.042	1.065	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

UISS and Multi-Function USV funding moved to PE 0603502N Proj:1234 Unmanned Surface Vehicle (USV)
Mine Warfare and Environmental Decision Aids Library (MEDAL) funding moved to Project Unit 1235

A. Mission Description and Budget Item Justification

This project provides resources for development, improvement and integration of MCM systems. A description of the major planned programs include the following:

1) AN/SQQ-32(V)4 High-Frequency, Wide Band (HFWB) is a technology upgrade to the AN/SQQ-32 Towed Body which will incorporate HFWB technology into the detection sonar to address performance deficiencies against new mine threats in the littorals. This upgrade will be installed on MCM-1 Class ships with the AN/SQQ-32(V)3 and will develop new transducer modules, fiber optic cable and modify topside processing and display software. 2) Mine Warfare and Environmental Decision Aids Library (MEDAL) is a software segment on the Global Command and Control System - Maritime (GCCS-M). MEDAL provides mine and mine warfare planning and evaluation tools and databases to the MCM Commander. 3) Develop and implement Mine Countermeasures Commander's Estimate of the Situation (MCM CES). 4) The Unmanned Influence Sweep System (UISS) utilizes an Unmanned Surface Vehicle (USV) integrated with an Unmanned Surface Sweep System (US3), a magnetic/acoustic sweep system developed to sweep acoustic/magnetic influence mines, which can be deployed from the Littoral Combat Ship (LCS) or a ship of opportunity; 5) The Multi-Function USV replaces the sweep system with a minehunting sensor. The capability leverages off a common USV to conduct minehunting missions. 6) AN/SLQ-60 Mine Neutralization System (MNS) Seafox on the MCM Class ships. MNS is the replacement to the existing AN/SLQ-48 Mine Neutralization System. 7) SSQ-94 MCM Trainer upgrade will incorporate the AN/SQQ-32 (V)4 sonar, SSN2(V)5 PINS and Mine Neutralization System Team Trainer.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: HFWB/PRODUCT DEVELOPMENT:	0.677	0.312	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued systems engineering, requirements analysis, design and development for AN/SQQ-32(V)4 HFWB P3I Through The Sensor (TTS) effort.					
FY 2017 Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continue systems engineering, requirements analysis, design and development for AN/SQQ-32(V)4 HFWB P3I TTS effort. ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:*** N/A					
Title: HFWB/SUPPORT: ***Articles:*** ***FY 2016 Accomplishments:*** Completed software requirements, configuration, and software integration for AN/SQQ-32(V)4 HFWB P3I TTS; Towed Body Performance Monitoring and Fault Location (PMFL) and Towed Body Positioning Solution efforts. ***FY 2017 Plans:*** Continue software requirements, configuration, and software integration for AN/SQQ-32(V)4 HFWB P3I TTS. ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:*** N/A	0.155 -	0.150 -	0.000 -	0.000 -	0.000 -
Title: HFWB/TEST AND EVALUATION: ***Articles:*** ***FY 2016 Accomplishments:*** Continued to perform lab and at sea testing for AN/SQQ-32(V)4 HFWB P3I TTS effort. Completed lab and at sea testing for PMFL and Towed Body Positioning Solution. ***FY 2017 Plans:*** Continue to perform lab and at sea testing for AN/SQQ-32(V)4 HFWB P3I effort and TTS. ***FY 2018 Base Plans:*** N/A ***FY 2018 OCO Plans:***	0.638 -	0.125 -	0.000 -	0.000 -	0.000 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Title: SSQ-94 MCM Trainer Development	4.666	3.650	0.000	0.000	0.000
Articles:	-	-	-	-	-
FY 2016 Accomplishments: SSQ-94 Mine Warfare Countermeasures Simulator; continued development of hardware and software upgrades to the combat system team/individual training capabilities on the MCM Class Ship					
FY 2017 Plans: SSQ-94 Mine Warfare Countermeasures Simulator; continue development of hardware and software upgrades to the combat system team/individual training capabilities on the MCM Class Ship					
FY 2018 Base Plans: N/A					
FY 2018 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	6.136	4.237	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• OPN/2622: *Minesweeping System Replacement*	21.014	56.675	57.023	-	57.023	42.849	41.464	42.296	42.876	Continuing	Continuing

Remarks

D. Acquisition Strategy

HFWB - Naval Surface Warfare Center, Panama City (NSWC, PC) and ARL UT designed and developed the HFWB upgrade to the AN/SQQ-32.

Mine Warfare and Environmental Decision Aids Library (MEDAL) - requirements for MEDAL Builds are generated through a formal requirements process. Requirements conferences gather a list of candidate functions based on a logical sequence to fully implement the overall software architecture. The fleet is presented with a recommended list of candidate capabilities based on this program plan, doctrine, fleet comments, and technology. These capability items are then prioritized by the fleet representatives (coordinated by Naval Mine Warfare and Anti-Submarine Command (NMAWC).The fleet inputs are then consolidated by COMINEWARCOM into an overall list which is then presented to Navy leadership for pricing and final selection. The selection is based on price, risk, available funding, and possibly by other

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1233 / *Surface MCM Mid-life Upgrade*

program factors (e.g., ensure that MEDAL supports other program delivery schedules). Selection balances immediate needs, long term objectives, technical maturity and other programmatic factors. A verification and validation process is applied to any algorithms, tactics, or models to be incorporated in the software. MEDAL development to include integration of data fusion techniques and incorporation of Data Access Layer (DAL) architecture to meet FORCEnet requirements. Acquisition strategy for Mine Countermeasures Commander's Estimate of the situation (MCM CES) is to deliver the software module within MEDAL builds by implementing the CES framework into the MEDAL software. SSQ-94 MCM Trainer upgrade will incorporate the AN/SQQ-32 (V)4 sonar, SSN2(V)5 PINS and Mine Neutralization System Team Trainer.

E. Performance Metrics

UISS - Successfully reached Milestone B in FY14; Awarded EDM contract.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1234 / *Unmanned Surface Vehicle (USV)*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
1234: *Unmanned Surface Vehicle (USV)*	23.259	22.962	43.412	23.594	-	23.594	22.106	16.238	20.052	19.860	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project provides resources for development, improvement and integration of Unmanned Surface Vehicle (USV) Mine Countermeasure systems. A description of the major planned programs include the following:

1) The Unmanned Influence Sweep System (UISS) utilizes an Unmanned Surface Vehicle (USV) integrated with an Unmanned Surface Sweep System (US3), a magnetic/acoustic sweep system developed to sweep acoustic/magnetic influence mines, which can be deployed from the Littoral Combat Ship (LCS) or a Craft of Opportunity (COOP);

2) Mine Hunting USVs (MHUs) include USVs towing AN/AQS-24 mine hunting sonars and associated support equipment, including a command and control center that can be deployed from shore and craft of opportunity. Current MHUs are in response to an Urgent Operational Need (UON) from Naval Forces Central Command with initial funding from FY 2016 Speed to Fleet (S2F) funding to start design to support fabrication of a replacement MHU vehicle, including new command and control center, and associated in-theater support equipment.

3) Unmanned Surface Vehicle with AN/AQS-20 sonar will integrate the existing AQS-20 mine-hunting sonar with an Unmanned Surface Vehicle (USV). This is referred to as the MCM USV and will leverage an existing USV design to include a modular payload capability.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: UISS Product Development	8.163	2.069	2.006	0.000	2.006
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued UISS Engineering Development Model (EDM) development.					
FY 2017 Plans: Continue UISS EDM development. Complete construction of USV craft and Unmanned Surface Sweep Payload and complete component level testing. Complete SW development and conduct regression testing to ensure functionality and identify fixes. Execute system integration and test phase. Conduct UISS EDM contractor					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
testing (CT) in preparations for Navy Developmental Testing (DT). During CT, identify any design changes that are needed in support of follow on production efforts. ***FY 2018 Base Plans:*** Support completion of UISS DT and Operational Assessment (OA) in support of Milestone C in 3QFY2018. During DT, identify any design changes that are needed in support of follow on production efforts. Complete the UISS EDM Technical Data Package (TDP) after completion of UISS EDM Developmental Testing (DT) and Operational Assessment (OA). Evaluate tech refresh product improvements. ***FY 2018 OCO Plans:*** N/A					
Title: UISS Support ***Articles:*** ***FY 2016 Accomplishments:*** Engineering, management, and logistics support for UISS system design, development, production, integration, and testing. ***FY 2017 Plans:*** Engineering, management, and logistics support for UISS system design, development, production, integration, and testing. ***FY 2018 Base Plans:*** Engineering, management, and integrated logistics support for Technical Data Package (TDP),conduct Functional Configuration Audit (FCA), and Production Readiness Review (PRR). Support a Milestone C decision in Q3, preparations for IOC in FY19, and start of the development of proposal for Full Rate Production (FRP). ***FY 2018 OCO Plans:*** N/A	0.976 -	1.260 -	0.200 -	0.000 -	0.200 -
Title: UISS Test and Evaluation ***Articles:*** ***FY 2016 Accomplishments:*** Commence UISS EDM contractor testing (CT). Testing includes craft, sub-system, and component testing in preparation for full system CT. ***FY 2017 Plans:***	1.889 -	1.937 -	0.000 -	0.000 -	0.000 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continue UISS EDM contractor testing (CT) in preparations for Navy Developmental Testing (DT), and commence Developmental Testing (DT). Testing includes both non-stressed and stressed testing when the payload is deployed and powered. USV and sweep payload functionality and performance as well as communications will be tested and verified. ***FY 2018 Base Plans:*** Complete DT and conduct Operational Assessment (OA) of UISS EDM. Conduct LCS integration efforts for risk reduction and system verification (provided LCS ship schedule supports) in preparation for OA. ***FY 2018 OCO Plans:*** N/A					
Title: UISS Management ***Articles:*** ***FY 2016 Accomplishments:*** Continued UISS EDM contract management. Initiated development of Milestone (MS) C documentation. ***FY 2017 Plans:*** Continue UISS EDM contract management. Continue development of MS C documentation. ***FY 2018 Base Plans:*** Manage efforts to get to Milestone C decision in Q3, start preparations for IOC in FY19, and start of the development of proposal for Full Rate Production (FRP)). Manage award of FY18 Low Rate Initial Production (LRIP) option. ***FY 2018 OCO Plans:*** N/A	1.034 -	0.838 -	0.088 -	0.000 -	0.088 -
Title: MHU Product Development ***Articles:*** ***FY 2016 Accomplishments:*** Continued improvements to the Command and Control (C2) center, MHU electronics and associated equipment. Completed initial integration of AN/AQS-24B sonar with MHU. Conducted initial performance testing of AN/ AQS-24B sonar towed from MHUs. Commenced design of one improved MHU hull, additional C2 center	10.500 -	8.186 -	0.100 -	0.000 -	0.100 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
equipment, and in-theater support equipment. Awarded Non-Recurring Engineering (NRE) initial design contract to Johns Hopkins University (JHU) for MHU 5 w/ Q24B. Conducted System Requirements Review (SRR). ***FY 2017 Plans:*** Deliver refurbished MHU w/ Q24B capability to fleet. Upgrade deployed MHUs to be Q24B compatible. Continue Non-Recurring Engineering (NRE) and hold Preliminary Design Review (PDR)/Critical Design Review (CDR) for MCM USV w/ Q24B. Investigate industry effort to do MHU 5 w/ Q24B deploy & retrieve (D&R) design and fabrication efforts as option to JHU effort. Make decision on plan for who will do MHU 5 w/ Q24B D&R system as well as start efforts for MHU 5 to be able to support AQS-20C as well. Award MHU 5 craft (same craft as MCM USV), payload (Q24B) D&R system efforts, and integration implementation contracts. Commence additional design and initial fabrication efforts. ***FY 2018 Base Plans:*** Complete design, fabrication, and initial integration of MHU 5 w/ Q24B payload. ***FY 2018 OCO Plans:*** N/A					
Title: MHU Support ***Articles:*** ***FY 2016 Accomplishments:*** Provided engineering and logistic support for product improvements and forward-deployed operations. Implemented multiple reliability improvements. ***FY 2017 Plans:*** Provide program management, engineering and logistics support for product improvements and forward deployed operations. Develop measurement system and improvement plan for system reliability. Perform design work to increase system range. ***FY 2018 Base Plans:*** Provide program management, engineering and logistics support for product improvements, to maintain Cyber security compliance and forward deployed operations. Upgrade system to Windows 10. ***FY 2018 OCO Plans:*** N/A	0.400 -	1.414 -	0.200 -	0.000 -	0.200 -
Title: MCM USV w/AQS-20 Product Development	0.000	23.000	17.100	0.000	17.100

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Articles:	-	-	-	-	-
FY 2016 Accomplishments: N/A ***FY 2017 Plans:*** Begin design and fabrication of one MCM USV EDM craft with a modular payload capability to support AN/AQS-20C and future payloads. Assess and implement Raytheon Independent Research and Development (IRAD) efforts for design of deploy and retrieve (D&R) system. Design and begin fabrication of D&R system to integrate the AN/AQS-20C mine-hunting sonar with the USV. Conduct design reviews. Start design & software development efforts for craft and payload integration, command & control, and operations. ***FY 2018 Base Plans:*** Complete fabrication of MCM USV EDM craft and associated Q-20C D&R system. Begin system level integration of initial MCM USV EDM with AN/AQS-20C minehunting sonar. Complete initial design & software development efforts for craft and payload integration, command & control, and operations. Conduct system level testing. Prepare to conduct Urgent Operational Evaluation System (UOES) Employment. ***FY 2018 OCO Plans:*** N/A					
Title: MCM USV w/ AQS-20 Support	0.000	4.708	3.900	0.000	3.900
Articles:	-	-	-	-	-
FY 2016 Accomplishments: N/A ***FY 2017 Plans:*** Provide program management, engineering and technical support for MCM USV EDM design and initial fabrication, and deploy and retrieve design and initial fabrication. Develop tactics, techniques, and procedures for MCM USV with AN/AQS-20C. ***FY 2018 Base Plans:*** Continue program management, engineering and technical support for efforts. Provide program management, engineering and technical support for system level testing and integration. ***FY 2018 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Accomplishments/Planned Programs Subtotals	22.962	43.412	23.594	0.000	23.594

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• 0603596N: *LCS Mission Modules*	16.800	3.300	3.900	-	3.900	5.000	1.800	0.000	0.000	0.000	64.129
• OPN/1601: *LCS MCM Mission Modules*	67.451	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	149.435

Remarks

RDT&E Funding included only reflects funding for UISS development efforts.

D. Acquisition Strategy

UISS - Requirements are documented in the Unmanned Influence Sweep System (UISS) Capability Development Document (CDD) and will be updated, as needed, in the UISS Capability Production Document (CPD). An Engineering and Manufacturing Development (E&MD) contract was awarded in FY14 with a planned option for Low Rate Initial Production (LRIP) in FY 2018.

E. Performance Metrics

UISS - Successfully reach Milestone C in 3Q FY 2018

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Product Development	C/CPIF	Textron Systems Inc : Hunt Valley, MD	12.375	8.163	Dec 2015	2.069	Dec 2016	2.006	Jan 2018	-		2.006	Continuing	Continuing	Continuing
MHU: Product Development	SS/CPFF	APL JHU : Laurel, MD	2.150	9.865	Mar 2016	0.200	Jun 2017	0.200	Jun 2018	-		0.200	0.000	12.415	-
MHU: Product Development	C/FPIF	Textron Systems Inc : Hunt Valley, MD	0.000	0.000		7.545	Mar 2017	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Product Development	WR	NSWC PC : Panama City, FL	0.501	0.260	Dec 2015	0.311	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Product Development	WR	NUWC N : Newport, RI	0.360	0.130	Dec 2015	0.250	Dec 2016	0.100	Mar 2018	-		0.100	Continuing	Continuing	Continuing
MHU: Product Development	WR	NSWC CD : Bethesda, MD	0.110	0.095	Dec 2015	0.030	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Product Development	WR	Various : Various	0.420	0.150	Dec 2015	0.050	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MCM USV: Product Development	C/FPIF	Textron Systems Inc : Hunt Valley, MD	0.000	0.000		11.540	Jan 2017	4.900	Jan 2018	-		4.900	0.000	16.440	-
MCM USV: Product Development	SS/FPIF	Raytheon : Portsmouth, RI	0.000	0.000		5.785	Jun 2017	0.500	Feb 2018	-		0.500	0.000	6.285	-
MCM USV: Product Development	WR	NSWC PC : Panama City, FL	0.000	0.000		2.225	Jan 2017	4.200	Jan 2018	-		4.200	0.000	6.425	-
MCM USV: Product Development	WR	NUWC N : Newport, RI	0.000	0.000		2.270	Jan 2017	3.800	Jan 2018	-		3.800	0.000	6.070	-
MCM USV: Product Development	WR	NSWC, CD : Bethesda, MD	0.000	0.000		0.980	Jun 2017	3.500	Jan 2018	-		3.500	0.000	4.480	-
		Subtotal	15.916	18.663		33.255		19.206		-		19.206	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Engineering Support	WR	NUWC, N : Newport, RI	0.200	0.150	Dec 2015	0.150	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Engineering Support	WR	NSWC, PC : Panama City, FL	1.486	0.203	Dec 2015	0.250	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Engineering Support	WR	NSWC, CD : Bethesda, MD	1.586	0.125	Dec 2015	0.170	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Engineering Support	C/CPFF	Textron Systems Inc : Hunt Valley, MD	0.550	0.120	Dec 2015	0.250	Dec 2016	0.200	Jan 2018	-		0.200	Continuing	Continuing	Continuing
UISS: Integrated Logistics	WR	NSWC, PC : Panama City, FL	0.200	0.090	Dec 2015	0.090	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Integrated Logistics	WR	NSWC, CD : Bethesda, MD	0.408	0.203	Dec 2015	0.250	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Integrated Logistics	C/CPFF	Textron Systems, Inc : Hunt Valley, MD	0.643	0.085	Dec 2015	0.100	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	SSC, PAC : San Diego, CA	0.210	0.050	Dec 2015	0.050	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	NSWC, PC : Panama City, FL	0.160	0.200	Dec 2015	0.457	Dec 2016	0.050	Feb 2018	-		0.050	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	NUWC, N : Newport, RI	0.160	0.100	Dec 2015	0.477	Dec 2016	0.150	Mar 2018	-		0.150	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	NSWC, CD : Bethesda, MD	0.110	0.050	Dec 2015	0.090	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MHU: Engineering Support	WR	Various : Various	0.180	0.000		0.340	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
MCM USV Engineering Support	C/CPFF	Textron Systems : Hunt Valley, MD	0.000	0.000		0.000		0.500	Jan 2018	-		0.500	0.000	0.500	-
MCM USV: Engineering Support	WR	NSWC, PC : Panama City, FL	0.000	0.000		2.458	Jan 2017	1.600	Jan 2018	-		1.600	0.000	4.058	-
MCM USV: Engineering Support	WR	NUWC, N : Newport, RI	0.000	0.000		2.250	Jan 2017	1.300	Jan 2018	-		1.300	0.000	3.550	-
MCM USV: Integrated Logistics	C/CPFF	Textron Systems : Hunt Valley, MD	0.000	0.000		0.000		0.500	Jan 2018	-		0.500	0.000	0.500	-
		Subtotal	5.893	1.376		7.382		4.300		-		4.300	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Test and Evaluation	WR	NSWC, PC : Panama City, FL	0.100	0.330	Mar 2016	0.771	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Test and Evaluation	WR	NSWC, CD : Bethesda, MD	0.250	0.400	Mar 2016	0.723	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
UISS: Test and Evaluation	C/CPIF	Textron Systems Inc : Hunt Valley, MD	0.050	1.159	Mar 2016	0.443	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	0.400	1.889		1.937		0.000		-		0.000	-	-	-

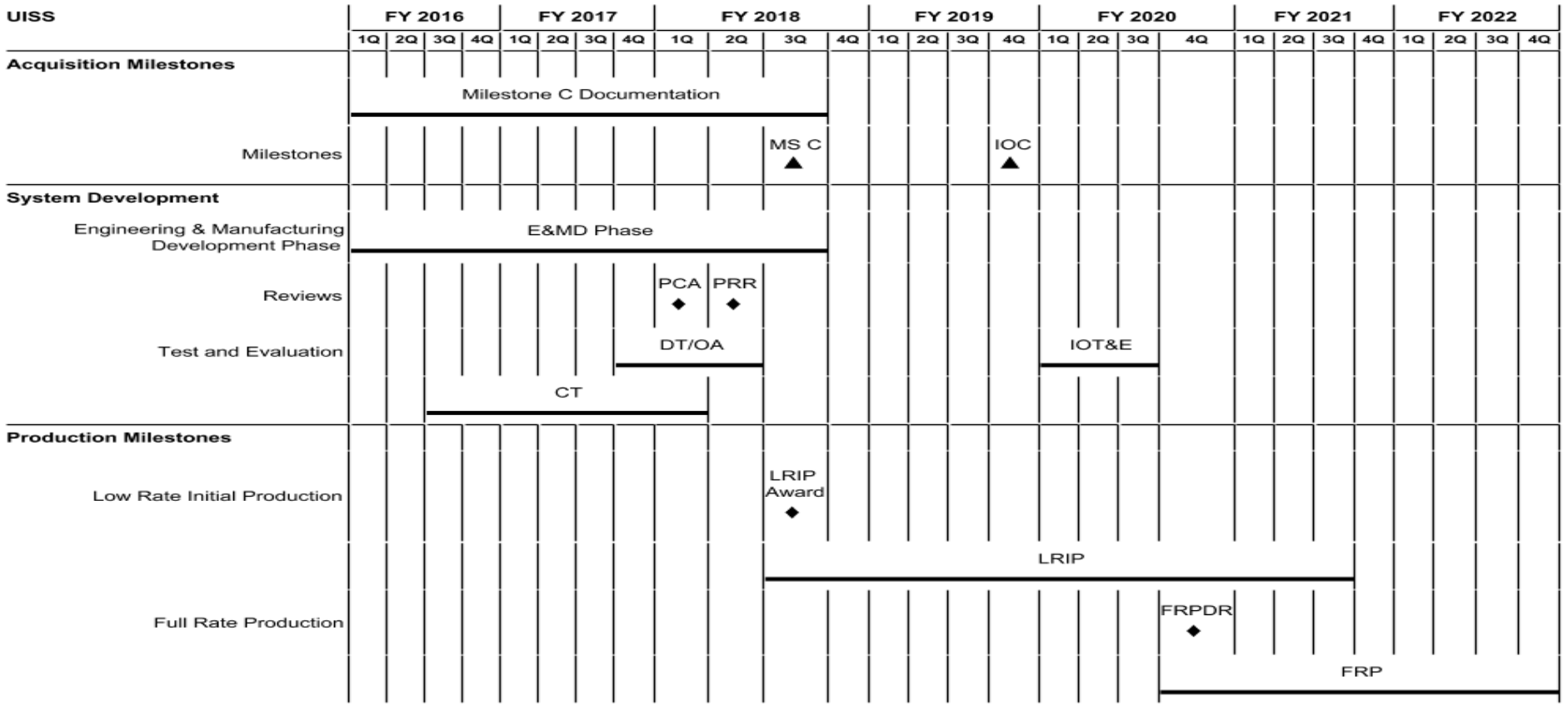
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UISS: Travel	WR	NAVSEA : Washington, DC	0.100	0.100	Jun 2016	0.095	Jun 2017	0.020	Jan 2018	-		0.020	0.000	0.315	-
UISS: Management	C/CPAF	TBD : TBD	0.950	0.934	Dec 2015	0.743	Dec 2016	0.068	Nov 2017	-		0.068	Continuing	Continuing	Continuing
		Subtotal	1.050	1.034		0.838		0.088		-		0.088	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	23.259	22.962		43.412		23.594		-		23.594	-	-	-

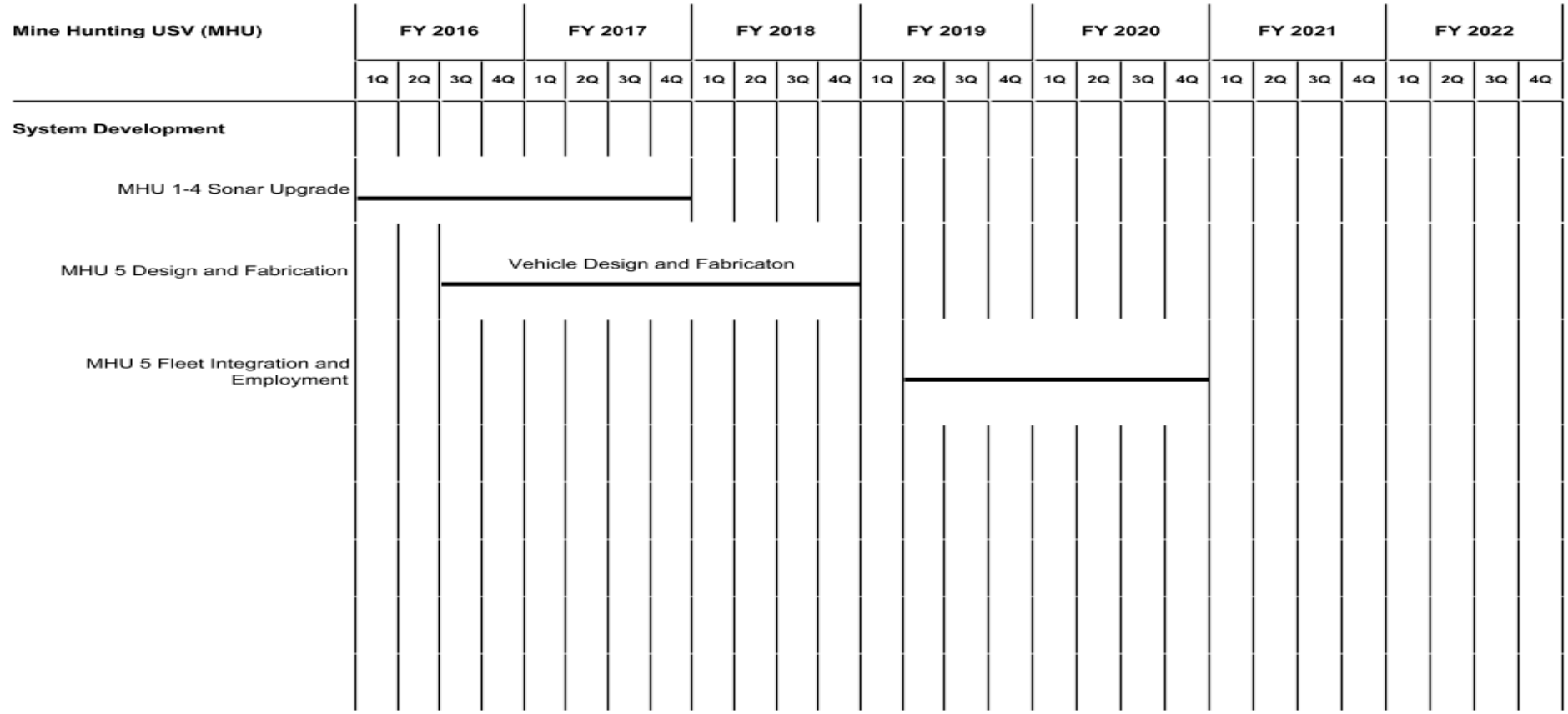
Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*



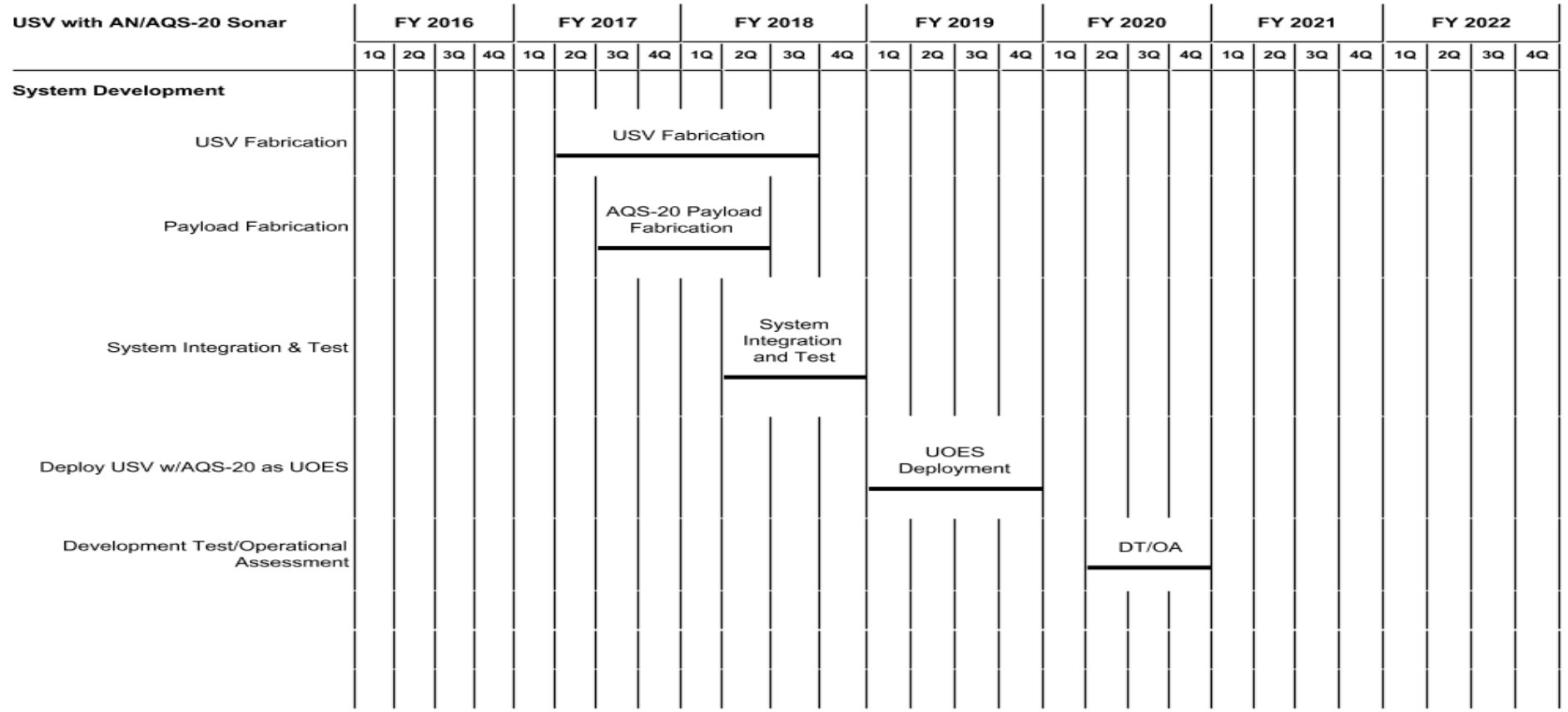
2018PB - 0603502N - 1234

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*



2018PB - 0603502N - 1234

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*



2018PB - 0603502N - 1234

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UISS				
Acquisition Milestones: Milestone C Documentation	1	2016	3	2018
Acquisition Milestones: Milestones: Milestone C	3	2018	3	2018
Acquisition Milestones: Milestones: Initial Operational Capability	4	2019	4	2019
System Development: Engineering & Manufacturing Development Phase: Engineering & Manufacturing Development phase	1	2016	3	2018
System Development: Reviews: Production Readiness Review (PRR)	2	2018	2	2018
System Development: Reviews: Physical Configuration Audit (PCA)	1	2018	1	2018
System Development: Test and Evaluation: DT Testing	4	2017	2	2018
System Development: Test and Evaluation: Initial Operational Test & Evaluation	1	2020	3	2020
System Development: Test and Evaluation: Contractor Testing	3	2016	1	2018
Production Milestones: Low Rate Initial Production: LRIP Contract Award	3	2018	3	2018
Production Milestones: Low Rate Initial Production: LRIP phase	3	2018	3	2021
Production Milestones: Full Rate Production: Full Rate Production Decision Review	4	2020	4	2020
Production Milestones: Full Rate Production: Full	4	2020	4	2022
Mine Hunting USV (MHU)				
System Development: MHU 1-4 Sonar Upgrade: Schedule Detail	1	2016	4	2017
System Development: MHU 5 Design and Fabrication: Schedule Detail	3	2016	4	2018
System Development: MHU 5 Fleet Integration and Employment: Fleet Integration	2	2019	4	2020
USV with AN/AQS-20 Sonar				
System Development: USV Fabrication: Schedule Detail	2	2017	3	2018
System Development: Payload Fabrication: Schedule Detail	3	2017	2	2018

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1234 / *Unmanned Surface Vehicle (USV)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
System Development: System Integration & Test: Schedule Detail	2	2018	4	2018
System Development: Deploy USV w/AQS-20 as UOES: Schedule Detail	1	2019	4	2019
System Development: Development Test/Operational Assessment: Schedule Detail	2	2020	4	2020

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 1235 / *Mine Warfare Planning and Analysis*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
1235: *Mine Warfare Planning and Analysis*	0.000	7.520	8.910	3.139	-	3.139	9.359	8.635	7.043	7.184	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Mine Warfare and Environmental Decision Aids Library (MEDAL) is a software segment on the Global Command and Control System - Maritime (GCCS-M). MEDAL provides mine and mine warfare planning and evaluation tools and databases to the MCM Commander.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: MEDAL Product Development	4.464	5.105	1.433	0.000	1.433
Articles:	-	-	-	-	-
FY 2016 Accomplishments: MEDAL EA - Completed MINEnet Tactical integration activities with LCS Mission Package. Completed Information Assurance (IA) accreditation Package and received Authority to Operate MINEnet Tactical v1.x on Navy networks. Completed MINEnet Tactical v1.2 development to include COBRA planning & evaluation capabilities. Develop MEDAL EA v2 supporting documentation development. Delivered MINEnet Tactical course curriculum to Mine Warfare Training Center Point Loma San Diego CA.					
FY 2017 Plans: MEDAL EA - MINEnet Tactical v1.3 development to include Minefield Planning initial capabilities. Continue planning for the development of MEDAL EA v2.0. Update MEDAL EA course curriculum for MINEnet Tactical 1.3.					
FY 2018 Base Plans: MEDAL EA - MINEnet Tactical v1.4 development to include enhanced Minefield Planning capabilities. Continue planning for the development of MEDAL EA v2.0. Update MEDAL EA course curriculum for MINEnet Tactical 1.4.					
FY 2018 OCO Plans: N/A					
Title: MEDAL Support	0.247	0.557	0.423	0.000	0.423
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
FY 2016 Accomplishments: Conducted oversight of the technical integration of developed algorithms and models that have demonstrated their effectiveness with respect to their objectives. Supported efforts to include communication with activities such as applied labs, government activities, and designated contractors. Assist in providing the speed, agility, adaptability, and flexibility required for modern MCM operations. Achieve IOC and begin fielding to achieve FOC. Begin the introduction of MEDAL EA MINEnet Tactical v1.1 capability and Planning on Risk (PoR) functionality via a limited fielding to Fleet Users including Mine Countermeasures Squadrons (MCMRONs) and Naval Surface and Mine War-fighting Development Center (SMWDC). ***FY 2017 Plans:*** Continue the development of MEDAL EA MINEnet Tactical v1.3 capability and Planning on Risk (PoR) functionality via a limited fielding to Fleet Users including Mine Countermeasures Squadrons (MCMRONs) and Naval Surface and Mine War-fighting Development Center (SMWDC). Provide technical integration of developed algorithms and models that have demonstrated their effectiveness with respect to their objectives. Support efforts to include communication with activities such as applied labs, government activities, and designated contractors. Assist in providing the speed, agility, adaptability, and flexibility required for modern MCM operations. ***FY 2018 Base Plans:*** Continue the development of MEDAL EA MINEnet Tactical v1.4 capability and Planning on Risk (PoR) functionality via a limited fielding to Fleet Users including Mine Countermeasures Squadrons (MCMRONs) and Naval Surface and Mine War-fighting Development Center (SMWDC). Provide technical integration of developed algorithms and models that have demonstrated their effectiveness with respect to their objectives. Support effort to include communication with activities such as applied labs, government activities, and designated contractors. Assist in providing the speed, agility, adaptability, and flexibility required for modern MCM operations. ***FY 2018 OCO Plans:*** N/A					
Title: MEDAL Test and Evaluation	2.398	2.519	0.675	0.000	0.675
Articles:	-	-	-	-	-
FY 2016 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
MEDAL EA - Conducted series of Devlopment tests (DTs) and a series of regression tests. Continue System Integration testing activities with multiple platforms. Conduct planning for subsequent OA events. Deliver to Fleet in accordance with the MEDAL EA Fielding Plan. ***FY 2017 Plans:*** MEDAL EA v1.3 Conduct series of Development tests (DTs) and a series of regression tests. Continue System Development testing activities with multiple platforms. Deliver to Fleet in accordance with the MEDAL EA Fielding Plan. ***FY 2018 Base Plans:*** MEDAL EA v1.4 Continue to conduct series of Development tests (DTs) and a series of regression tests. Continue System Development testing activities with multiple platforms. Deliver to Fleet in accordance with the MEDAL EA Fielding Plan. ***FY 2018 OCO Plans:*** N/A					
Title: MEDAL Management	0.411	0.729	0.608	0.000	0.608
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Provided program management support and travel for MEDAL program. Program management included overall technical guidance and leadership for the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. As part of the systems engineering element of PM, communicate and coordinate with MIW C4ISR, ICWS, Organic MCM, Mainstreaming MIEW, Expeditionary Warfare C4ISR, tactics development, long term planning, Naval Special Clearance Team (NSCT-1) Assault Breaching System (ABS), LCS, and other programs as they relate to MEDAL and MIW Mission Planning, Evaluation, and C4ISR. Other PM tasking to include briefings, demonstrations, and project planning as required. ***FY 2017 Plans:*** Provide program management support and travel for MEDAL program. Program management shall include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. As part of the systems engineering element of PM, communicate and coordinate with MIW C4ISR, ICWS, Organic MCM, Mainstreaming MIEW, Expeditionary Warfare C4ISR, tactics development, long					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
term planning, Naval Special Clearance Team (NSCT-1) Assault Breaching System (ABS), LCS, and other programs as they relate to MEDAL and MIW Mission Planning, Evaluation, and C4ISR. Other PM tasking to include briefings, demonstrations, and project planning as required. ***FY 2018 Base Plans:*** Continue to provide program management support and travel for MEDAL program. Program management shall include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. As part of the systems engineering element of PM, communicate and coordinate with MIW C4ISR, ICWS, Organic MCM, Mainstreaming MIEW, Expeditionary Warfare C4ISR, tactics development, long term planning, Naval Special Clearance Team (NSCT-1) Assault Breaching System (ABS), LCS, and other programs as they relate to MEDAL and MIW Mission Planning, Evaluation, and C4ISR. Other PM tasking to include briefings, demonstrations, and project planning as required. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	7.520	8.910	3.139	0.000	3.139

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• 2622/LV075: *Mine Sweeping Replacement (MEDAL).*	2.973	4.349	3.673	-	3.673	1.135	0.798	0.850	0.000	0.000	16.628

Remarks

D. Acquisition Strategy

Mine Warfare and Environmental Decision Aids Library (MEDAL) - requirements for MEDAL Builds are generated through a formal requirements process. Requirements conferences gather a list of candidate functions based on a logical sequence to fully implement the overall software architecture. The fleet is presented with a recommended list of candidate capabilities based on this program plan, doctrine, fleet comments, and technology. These capability items are then prioritized by the fleet representatives (coordinated by Naval Surface and Mine War-fighting Development Center (SMWDC). The fleet inputs are then consolidated by COMINEWARCOM into an overall list which is then presented to Navy leadership for pricing and final selection. The selection is based on price, risk, available funding, and possibly by other program factors (e.g., ensure that MEDAL supports other program delivery schedules). Selection balances immediate needs, long term objectives, technical maturity and other programmatic factors. A verification and validation process is applied to any algorithms, tactics, or models to be incorporated in the software.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 1235 / *Mine Warfare Planning and Analysis*

E. Performance Metrics

Mine Warfare and Environmental Decision Aids Library (MEDAL) development to include integration of data fusion techniques and incorporation of Data Access Layer (DAL) architecture to meet FORCEnet requirements.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 2094. / *Unmanned Underwater Vehicle*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2094.: *Unmanned Underwater Vehicle*	52.964	11.896	67.607	60.187	-	60.187	122.167	139.433	149.242	162.623	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Snakehead Large Displacement Unmanned Undersea Vehicle (LDUUV) program will design and build a modular, reconfigurable Unmanned Undersea Vehicle (UUV) with Open Architecture (OA) software (SW) focused on introducing a new class (large displacement) of UUVs to the Navy to provide increased endurance, payload hosting, and delivery capability. The Snakehead LDUUV will be modular in design and include hotel functionality (guidance and control, navigation, autonomy, situational awareness, core communications, and power distribution), energy and power, propulsion and maneuvering, mission sensors, and communications links. It is intended that modules will have well defined interfaces for the purposes of implementing cost-effective upgrades in future increments to leverage advances in technology. The Snakehead LDUUV is a phased approach to build capabilities at a manageable level of risk in the Navy's class of Large Displacement Unmanned Undersea Vehicles. It consists of two phases of government-led development with significant industry involvement transitioning to industry production of the full vehicles. .

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: LDUUV Product Development	7.843	61.114	51.838	0.000	51.838
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Completed Test and Evaluation Master Plan (TEMP). Conducted Gate 4 review. Initiated development of government conceptual design for LDUUV prototype. Continued risk reduction experimentation and prototyping efforts to prove LDUUV can meet targets for extended unmanned operation, and submarine and ship integration efforts enabling LDUUV launch and recover from surface ships.					
FY 2017 Plans: Develop government preliminary design for LDUUV risk-reduction prototypes (hydrodynamics, propulsion, payload, and command and control). Conduct Preliminary Design Review (PDR) and start detailed design efforts.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Conduct risk reduction engineering with battery certification, and initial autonomy efforts to prove LDUUV can meet targets for extended unmanned operation and integration efforts enabling LDUUV launch and recovery from submarines and ships. ***FY 2018 Base Plans:*** Conduct detailed design for two Phase I LDUUV prototypes, and prepare for Critical Design Review (CDR). Continue Industry supported experimentation with autonomy sense and avoidance, Intelligence Preparation of Operational Environment (IPOE) demonstrations, and propulsion, navigation, communications, launch and recovery experimentation to reduce risk with submarine and surface ship integration. ***FY 2018 OCO Plans:*** N/A					
Title: LDUUV Support ***Articles:*** ***FY 2016 Accomplishments:*** Developed and updated program documentation Gate 4 review and preliminary design. ***FY 2017 Plans:*** For government-led effort, initiate program documentation updates (system/subsystem specification and interface control documents) based on prototype preliminary design. ***FY 2018 Base Plans:*** Complete initial development of documentation and drawings, Submarine Interface Control documents, System Hazard Analysis, Master System Test and Evaluation Plan (MSTEP); work on required documentation for detailed design and critical design review. ***FY 2018 OCO Plans:*** N/A	2.694 -	4.839 -	6.662 -	0.000 -	6.662 -
Title: LDUUV Management ***Articles:*** ***FY 2016 Accomplishments:*** Provided program management (PM) support and travel for the LDUUV program. Program management included overall technical guidance and leadership for the program. Oversight of financial and logistics efforts	1.359 -	1.654 -	1.687 -	0.000 -	1.687 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
and coordination with Navy and other DoD organizations and contractors performed to ensure successful execution of the program. Travel and other PM tasking conducted to include briefings, demonstrations, and project planning as required ***FY 2017 Plans:*** Provide program management support and travel for the LDUUV program. Program management shall include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. ***FY 2018 Base Plans:*** Provide program management support and travel for the LDUUV program. Program management plans include overall technical guidance and leadership for the program. Oversight of financial and logistics efforts and coordination with Navy and other DoD organizations and contractors as required to ensure successful execution of the program. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	11.896	67.607	60.187	0.000	60.187

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Utilizing Navy requirements to insert incremental capability, the LDUUV program will design, build, and test risk-reducing prototype UUVs in two phases followed by competitive award of a production contract.

E. Performance Metrics

LDUUV - Complete Preliminary Design Review (PDR) 4Q FY17
LDUUV - Complete Critical Design Review (CDR) 3Q FY19

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV Experimentation and Prototype Design	WR	NUWC Newport : Newport, RI	4.444	2.160	Dec 2016	17.430	Dec 2016	9.127	Dec 2017	-		9.127	0.000	33.161	-
LDUUV Experimentation and Prototype Design & Hardware	C/CPFF	Various : Various	13.299	0.000		16.285	Feb 2017	27.871	Feb 2018	-		27.871	0.000	57.455	-
LDUUV Experimentation and Prototype Design	WR	NSWC Carderock : Carderock, MD	0.000	1.705	Dec 2016	5.888	Dec 2016	2.920	Dec 2017	-		2.920	0.000	10.513	-
LDUUV Experimentation and Prototype Design	WR	NSWC PCD : Panama City, FL	0.000	0.400	Dec 2016	0.286	Dec 2016	0.166	Dec 2017	-		0.166	0.000	0.852	-
LDUUV Experimentation and Prototype Design	SS/CPFF	ARL PSU : State College, PA	0.000	0.907	Jan 2017	13.902	Jan 2017	6.176	Jan 2018	-		6.176	0.000	20.985	-
LDUUV Experimentation and Prototype Design	SS/CPFF	APL/JHU : Laurel, MD	0.000	0.988	Jan 2017	0.000		0.000		-		0.000	0.000	0.988	-
LDUUV Experimentation and Prototype Design	WR	SSC Pacific : San Diego, CA	0.000	0.455	Jan 2017	0.659	Jan 2017	0.423	Feb 2018	-		0.423	0.000	1.537	-
LDUUV Experimentation and Prototype Design	WR	NUWC KPT : Keyport, WA	0.000	0.075	Jan 2017	4.826	Jan 2017	4.391	Feb 2018	-		4.391	0.000	9.292	-
LDUUV Experimentation and Risk Reduction Sonar	C/CPFF	ARL UT : Austin, TX	0.000	0.228	Jan 2017	1.198	Jan 2017	0.551	Feb 2018	-		0.551	0.000	1.977	-
LDUUV Experimentation and Risk Reduction - Battery Certification	WR	NSWC Crane : Crane IN	0.000	0.925	Dec 2016	0.640	Dec 2016	0.213	Dec 2017	-		0.213	0.000	1.778	-
		Subtotal	17.743	7.843		61.114		51.838		-		51.838	0.000	138.538	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV ILS & Engineering Support	Various	VAR : VAR	17.768	0.000		0.000		0.000		-		0.000	0.000	17.768	-
PLUS ILS & Engineering Support	Various	VAR : VAR	8.321	0.000		0.000		0.000		-		0.000	0.000	8.321	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV Engineering Support	WR	NUWC Newport : Newport, RI	0.000	1.079	Dec 2016	2.201	Dec 2016	4.452	Dec 2017	-		4.452	0.000	7.732	-
LDUUV Launch and Recovery Engineering Support	WR	NSWC PCD : Panama City, FL	0.000	0.000		0.300	Dec 2016	0.306	Dec 2017	-		0.306	0.000	0.606	-
LDUUV Hydrodynamics and Propulsion Engineering Support	C/CPFF	VAR : VAR	0.000	0.295	Feb 2017	0.549	Feb 2017	0.450	Feb 2018	-		0.450	0.000	1.294	-
LDUUV Hull and Propulsion Engineering Support	WR	NSWC Carderock : Carderock, MD	0.000	0.288	Dec 2016	0.280	Dec 2016	0.286	Dec 2017	-		0.286	0.000	0.854	-
LDUUV Command and Control Engineering Support	WR	SSC Pacific : San Diego, CA	0.000	0.122	Jan 2017	0.000		0.000		-		0.000	0.000	0.122	-
LDUUV Acoustic Engineering Support	SS/CPFF	ARL UW : Seattle, WA	0.000	0.200	Jan 2017	0.204	Jan 2017	0.208	Jan 2018	-		0.208	0.000	0.612	-
LDUUV Engineering Support	SS/CPFF	APL/JHU : Laurel, MD	0.000	0.275	Jan 2017	0.330	Jan 2017	0.335	Jan 2018	-		0.335	0.000	0.940	-
LDUUV ILS & Engineering Support	WR	NUWC Keyport : Keyport, WA	0.000	0.325	Dec 2016	0.125	Dec 2016	0.125	Dec 2017	-		0.125	0.000	0.575	-
LDUUV ILS & Engineering Support2	SS/CPFF	VAR : VAR	0.000	0.110	Feb 2017	0.850	Feb 2017	0.500	Feb 2018	-		0.500	0.000	1.460	-
		Subtotal	26.089	2.694		4.839		6.662		-		6.662	0.000	40.284	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PLUS Fleet Experimentation	Various	Various : Various	5.077	0.000		0.000		0.000		-		0.000	0.000	5.077	-
		Subtotal	5.077	0.000		0.000		0.000		-		0.000	0.000	5.077	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDUUV Program Management	WR	NUWC Newport : Newport, RI	1.365	0.350	Dec 2016	0.525	Dec 2016	0.536	Dec 2017	-		0.536	Continuing	Continuing	Continuing
LDUUV Program Management	TBD	TBD : TBD	1.075	0.824	Dec 2016	0.970	Dec 2016	0.989	Dec 2017	-		0.989	0.000	3.858	-
LDUUV Travel	Various	NAVSEA : Washington, DC	0.215	0.185	Dec 2016	0.159	Dec 2016	0.162	Dec 2017	-		0.162	0.000	0.721	-
PLUS Program Management	Various	VAR : VAR	1.239	0.000		0.000		0.000		-		0.000	0.000	1.239	-
PLUS Travel	Various	NAVSEA : Washington, DC	0.161	0.000		0.000		0.000		-		0.000	0.000	0.161	-
		Subtotal	4.055	1.359		1.654		1.687		-		1.687	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	52.964	11.896		67.607		60.187		-		60.187	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

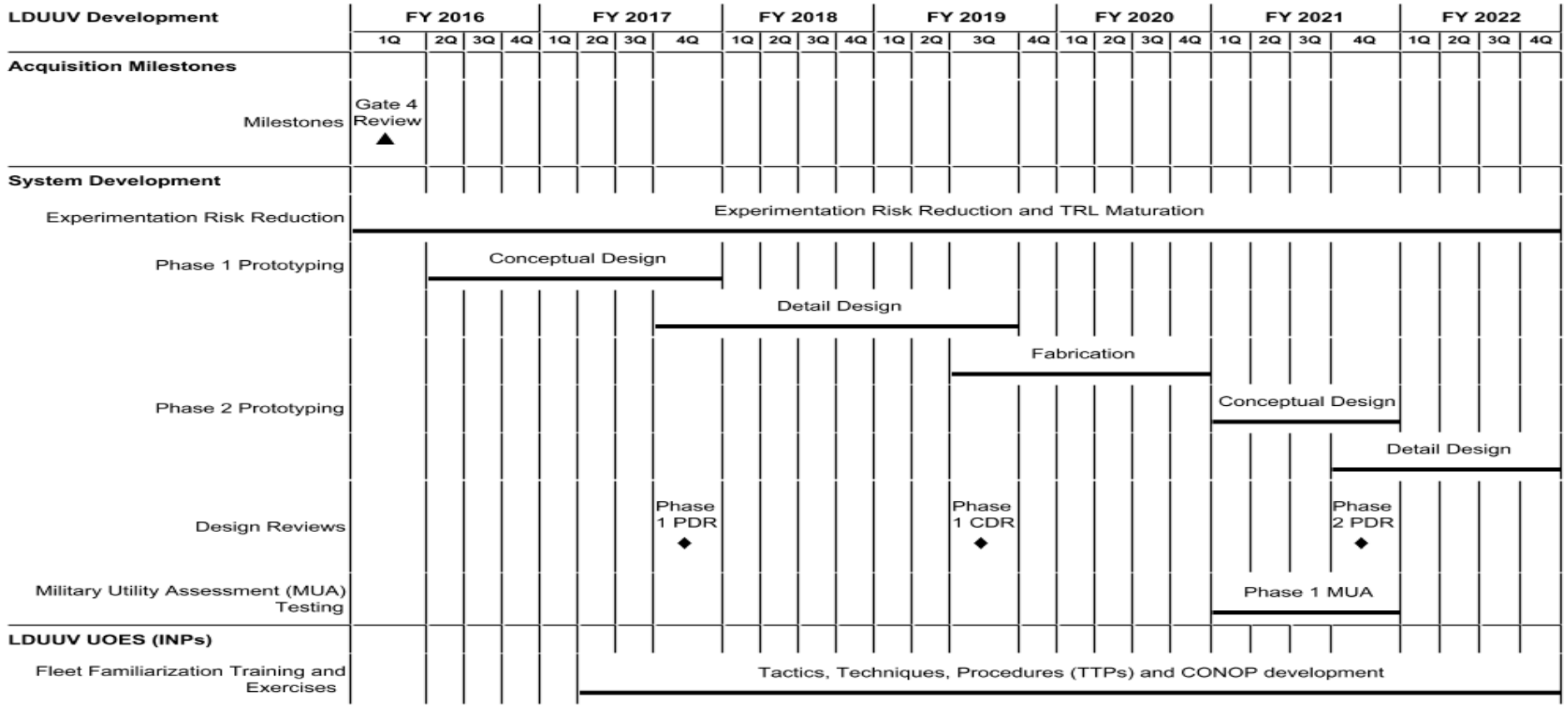


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Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2094. / *Unmanned Underwater Vehicle*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
LDUUV Development				
Acquisition Milestones: Milestones: Gate 4 Review	1	2016	1	2016
System Development: Experimentation Risk Reduction: Technology Risk Reduction	1	2016	4	2022
System Development: Phase 1 Prototyping: Prototype Conceptual Design	2	2016	4	2017
System Development: Phase 1 Prototyping: Protoype Detail Design	4	2017	3	2019
System Development: Phase 1 Prototyping: Prototype Fabrication	3	2019	4	2020
System Development: Phase 2 Prototyping: Prototype Conceptual Design	1	2021	4	2021
System Development: Phase 2 Prototyping: Prototype Detail Design	4	2021	4	2022
System Development: Design Reviews: Phase 1 PDR	4	2017	4	2017
System Development: Design Reviews: Phase 1 CDR	3	2019	3	2019
System Development: Design Reviews: Phase 2 PDR	4	2021	4	2021
System Development: Military Utility Assessment (MUA) Testing: Phase 1 MUA	1	2021	4	2021
LDUUV UOES (INPs): Fleet Familiarization Training and Exercises: Schedule Detail	2	2017	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy										Date: May 2017		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*				Project (Number/Name) 2131 / *Assault Breaching System*			
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
2131: *Assault Breaching System*	595.138	15.097	20.201	11.623	-	11.623	20.950	20.673	17.319	17.666	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program provides a combination of U.S. Navy systems to counter the threat to amphibious forces from obstacles and anti-landing/sea mines in the Beach Zone and Surf Zone (0-10 ft water). The Assault Breaching Systems (ABS) consist of a system of systems approach that includes the following programs: JABS - Joint Direct Attack Munition (JDAM) Assault Breaching System; CMS - Countermine System; COBRA - Coastal Battlefield Reconnaissance and Analysis; PNMS - Precision Navigation and Marking System; and C4I - Command, Control, Computers, Communications, and Intelligence. The Assault Breaching Systems enable the Navy-Marine Corps team to conduct Joint Forcible Entry Operations (JFEO), Ship-To-Objective Maneuver (STOM), and other combat operations to project power ashore.

The JDAM Assault Breaching System (JABS) is a currently fielded system that neutralizes surface mines and obstacles in the Beach Zone and Surf Zone. The ABS Tactical Decision Aid optimizes the Desired Points of Impact (DPI) for JDAM munitions to effectively neutralize mines and obstacles while minimizing the required number of munitions and friendly aircraft sorties. Continued testing is required to optimize the ABS Tactical Decision Aid database for the most common enemy mines and obstacles.

Coastal Battlefield Reconnaissance and Analysis (COBRA) is the ABS program to conduct ISR/T. This system provides Airborne Mine Countermeasures (AMCM) capability, and one system consists of two Airborne Payloads and one Post Mission Analysis Station. Under the umbrella of evolutionary acquisition, three increments of development are planned. Block I is a multispectral sensor capable of daytime detection of surface-laid minefields and obstacles in the Beach Zone. Block II adds a 3D LIDAR (Light Detection and Ranging) sensor that enables nighttime detection of mines and obstacles in the Beach Zone and the Surf Zone (0-10 ft of water). Block II also adds on-board near real-time processing of multispectral imagery data. Block III adds an interferometric sensor that is capable of detecting buried mines. Blocks II and III will incorporate technology being developed by 6.3 S&T. COBRA consists of a modular payload architecture that can be integrated onto the MQ-8B Fire Scout or USN manned helicopters like the MH-60. COBRA will serve as the "detect" mission module in the Surf Zone and Beach Zone for the Littoral Combat Ship (LCS) Mine Warfare mission package.

Precision Navigation & Marking System (PNMS) provides navigational upgrades for the Landing Craft, Air Cushion (LCAC); Landing Craft, Utility (LCU); and Amphibious Assault Vehicle (AAV). A system of virtual lane marking improves the navigation ability of these three assault craft which enables them to navigate safely through the neutralized assault lanes provided by JABS and CMS. OPN funds the CRAFTALTS to upgrade the navigation systems. LCU Navigation Upgrade: Modernized the navigation system to enable safe transit through the breached lane. LCAC Autopilot Upgrade: An integrated improvement to the LCAC Service Life Extension Program (SLEP) navigation system for craft control that allows precise navigation and hovering within the breached lane. These software upgrades and backfits occur during scheduled LCAC SLEPs. AAV Navigation Upgrade : Modernize the navigation system to enable precise transit through the breached lane.

Command, Control, Computers, Communications and Intelligence (C4I) system will tie all of the above systems together under an integrated ABS architecture that is compatible with the existing Mine Warfare architecture.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Product Development:	8.650	11.836	7.668	0.000	7.668
Articles:	-	-	-	-	-
FY 2016 Accomplishments: COBRA - Continued Block 1 integration Flight Tests with MQ-8B FIRESCOUT. Continued design and development of COBRA Block II capability. JABS - Designed and engineered weapon effectivness for beach zones and surf zones. Precision Navigation/Marking (PN/M) - Continued evaluation/assessment of EDMs supporting PN/M efforts.					
FY 2017 Plans: COBRA - Complete Block 1 integration Flight Tests with MQ-8B FIRESCOUT. Continue design and development of COBRA Block II capability. JABS - Design and engineering of weapon effectivness for beach zones and surf zones. Precision Navigation/Marking (PN/M) - continue evaluation/assessment of EDMs supporting PN/M efforts.					
FY 2018 Base Plans: COBRA - Increase design and development of COBRA Block II hardware and begin initial test planning of Block II capabilities. JABS - Continue design and engineering of weapon effectiveness for beach and surf zones. Precision Navigation/Marking - Continue evaluation/assessment of EDMs supporting PN/M efforts.					
FY 2018 OCO Plans: N/A					
Title: Technical Support:	0.805	1.507	0.942	0.000	0.942
Articles:	-	-	-	-	-
FY 2016 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
COBRA - Provided mine magazine inventory management and shipping, contract and test/studies, C4I Data Fusion. Provided technical /acquisition support and documentation (ILS, training, data, drawings). ***FY 2017 Plans:*** COBRA - Provide mine magazine inventory management and shipping, contract and test/studies, C4I Data Fusion. Provide technical /acquisition support and documenttation (ILS, training, data, drawings). ***FY 2018 Base Plans:*** COBRA - Continue to provide mine magazine inventory management and shipping, contract and test/studies, C4I Data Fusion. Provide technical /acquisition support and documenttation (ILS, training, data, drawings). ***FY 2018 OCO Plans:*** N/A					
Title: Test and Evaluation:	4.523	5.723	2.209	0.000	2.209
Articles:	-	-	-	-	-
FY 2016 Accomplishments: COBRA - Conducted Block I Development Testing (DT) Phase I. Conducted advanced component Block II Development Testing. Development Testing (DT). JABS - Continued Surf Zone (SZ) and Beach Zone (BZ) characterization testing. PN/M - Continued to test the Precision Navigation and Marking design capability ***FY 2017 Plans:*** COBRA - Continue advanced Block II component Development Testing. JABS - Surf Zone (SZ) and Beach Zone (BZ) characterization testing. PN/M - Continue to test the Precision Navigation and Marking design capability. ***FY 2018 Base Plans:*** COBRA - Conduct surf zone prototype flight testing.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
JABS - Surf Zone (SZ) and Beach Zone (BZ) characterization testing. ***FY 2018 OCO Plans:*** N/A					
Title: Management: ***Articles:***	1.119 -	1.135 -	0.804 -	0.000 -	0.804 -
FY 2016 Accomplishments: Managed Mine magazine inventory management and shipping, contract management and tests/studies, C4I/ Data fusion. ***FY 2017 Plans:*** Manage Mine magazine inventory management and shipping, contract management and tests/studies, C4I/Data fusion. ***FY 2018 Base Plans:*** Continue to manage Mine magazine inventory management and shipping, contract management and tests/ studies, C4I/Data fusion. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	15.097	20.201	11.623	0.000	11.623

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• OPN/2624: *SHALLOW WATER Mine CM SHIP*	0.000	8.875	8.796	-	8.796	8.782	8.901	5.741	5.855	0.000	95.423

Remarks

D. Acquisition Strategy

Countermine/Counter Obstacle (CM/CO)is JDAM Assault Breaching System (JABS) and ABS Tactical Decision Aid testing is ongoing.

Intelligence/Surveillance/Reconnaissance/Targeting (ISR/T) - COBRA Block I achieved MS C in 3rd QTR FY 2009. COBRA Block II technology transferred from ONR and will achieve MS B in 3nd QTR FY17. COBRA Block III technology will transition in FY19.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

Precision Navigation & Marking System (PNMS) - The navigation upgrades for the Landing Craft, Air Cushion (LCAC) and Landing Craft, Utility (LCU) are complete. AAV enhancements will be achieved through an ECP (PMA AAV (Marine Corps)) in 1st QTR FY 2019.

E. Performance Metrics

Successful COBRA integration, flight tests: Operational Assessment (OA) and Development Testing (DT) into the MQ-8B FIRESCOUT. COBRA will achieve IOC in FY 2017.

The above systems continue to meet or exceed their Key Performance Parameters.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary Hardware Dev, COBRA	C/CPAF	Arete : Tucson, AZ	166.916	5.642	Apr 2016	9.054	Jan 2017	5.347	Dec 2017	-		5.347	0.000	186.959	-
Primary Hardware Dev, CMS	C/CPAF	Boeing : St. Louis, MO	99.974	0.000		0.000		0.000		-		0.000	0.000	99.974	-
Ancillary Hardware Dev, JABS	C/CPAF	Various : Various	22.078	0.000		0.000		0.000		-		0.000	0.000	22.078	-
Systems Engineering, COBRA	WR	NSWC, PC : PANAMA CITY, FL	20.860	0.000		0.000		0.781	Oct 2017	-		0.781	0.000	21.641	-
Software Dev, COBRA	WR	NAVAIR : Patuxent River, MD	12.958	0.000		0.000		0.000		-		0.000	0.000	12.958	-
Systems Engineering, CMS	WR	NSWC, PC : PANAMA CITY, FL	31.505	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
JABS	WR	NSWC PC : NSWC IH	6.662	1.801	Dec 2015	1.656	May 2017	0.799	Nov 2017	-		0.799	0.000	10.918	-
Training Dev, COBRA	WR	NSWC, PC : PANAMA CITY, FL	10.111	0.475	Nov 2015	0.775	Oct 2016	0.559	Nov 2017	-		0.559	0.000	11.920	-
Tooling	WR	NSWC, PC : PANAMA CITY, FL	0.860	0.000		0.000		0.000		-		0.000	0.000	0.860	-
ABS IPT/Test Assets/Proj Eng	WR	NSWC, PC : PANAMA CITY, FL	8.814	0.251	Oct 2015	0.351	May 2017	0.182	Nov 2017	-		0.182	0.000	9.598	-
Precision Navigation & Marking	WR	NSWC, PC : PANAMA CITY, FL	16.045	0.481	Nov 2015	0.000		0.000		-		0.000	0.000	16.526	-
		Subtotal	396.783	8.650		11.836		7.668		-		7.668	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Support Equipment	WR	NSWC, PC : PANAMA CITY, FL	20.082	0.649	Oct 2015	0.849	Oct 2016	0.613	Nov 2017	-		0.613	0.000	22.193	-
Software Development	WR	NSWC, PC : PANAMA CITY, FL	8.037	0.000		0.202	Nov 2016	0.000		-		0.000	0.000	8.239	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 2131 / *Assault Breaching System*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Integrated Logistics Support	WR	NSWC, IH : INDIAN HEAD, MD	2.712	0.000		0.100	Oct 2016	0.072	Nov 2017	-		0.072	0.000	2.884	-
Configuration Management	WR	NSWC, PC : PANAMA CITY, FL	3.744	0.000		0.100	Nov 2016	0.072	Oct 2017	-		0.072	0.000	3.916	-
Technical Data	WR	NSWC, PC : PANAMA CITY, FL	2.588	0.000		0.000		0.000		-		0.000	0.000	2.588	-
Studies & Analysis	WR	NSWC, PC : PANAMA CITY, FL	6.120	0.156	Nov 2015	0.256	Nov 2016	0.185	Oct 2017	-		0.185	0.000	6.717	-
GFE	WR	NSWC, PC : PANAMA CITY, FL	0.400	0.000		0.000		0.000		-		0.000	0.000	0.400	-
		Subtotal	43.683	0.805		1.507		0.942		-		0.942	0.000	46.937	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Development Test & Evaluation	WR	NSWC, IH : INDIAN HEAD, MD	58.424	2.474	Nov 2015	2.525	May 2017	1.126	Oct 2017	-		1.126	0.000	64.549	-
Operational Test & Evaluation	WR	NSWC/ IH, PC : INDIAN HEAD, PANAMA CITY	8.655	0.000		1.175	Nov 2016	0.361	Nov 2017	-		0.361	0.000	10.191	-
Tooling	WR	NSWC/ IH, PC : INDIAN HEAD, PANAMA CITY	0.700	0.000		0.000		0.000		-		0.000	0.000	0.700	-
GFE	WR	NSWC/ IH, PC : INDIAN HEAD, PANAMA CITY	0.400	0.000		0.000		0.000		-		0.000	0.000	0.400	-
Development Test	WR	NSWC PC : Panama City, FL	11.585	2.049	Nov 2015	2.023	May 2017	0.722	Nov 2017	-		0.722	0.000	16.379	-
		Subtotal	79.764	4.523		5.723		2.209		-		2.209	0.000	92.219	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

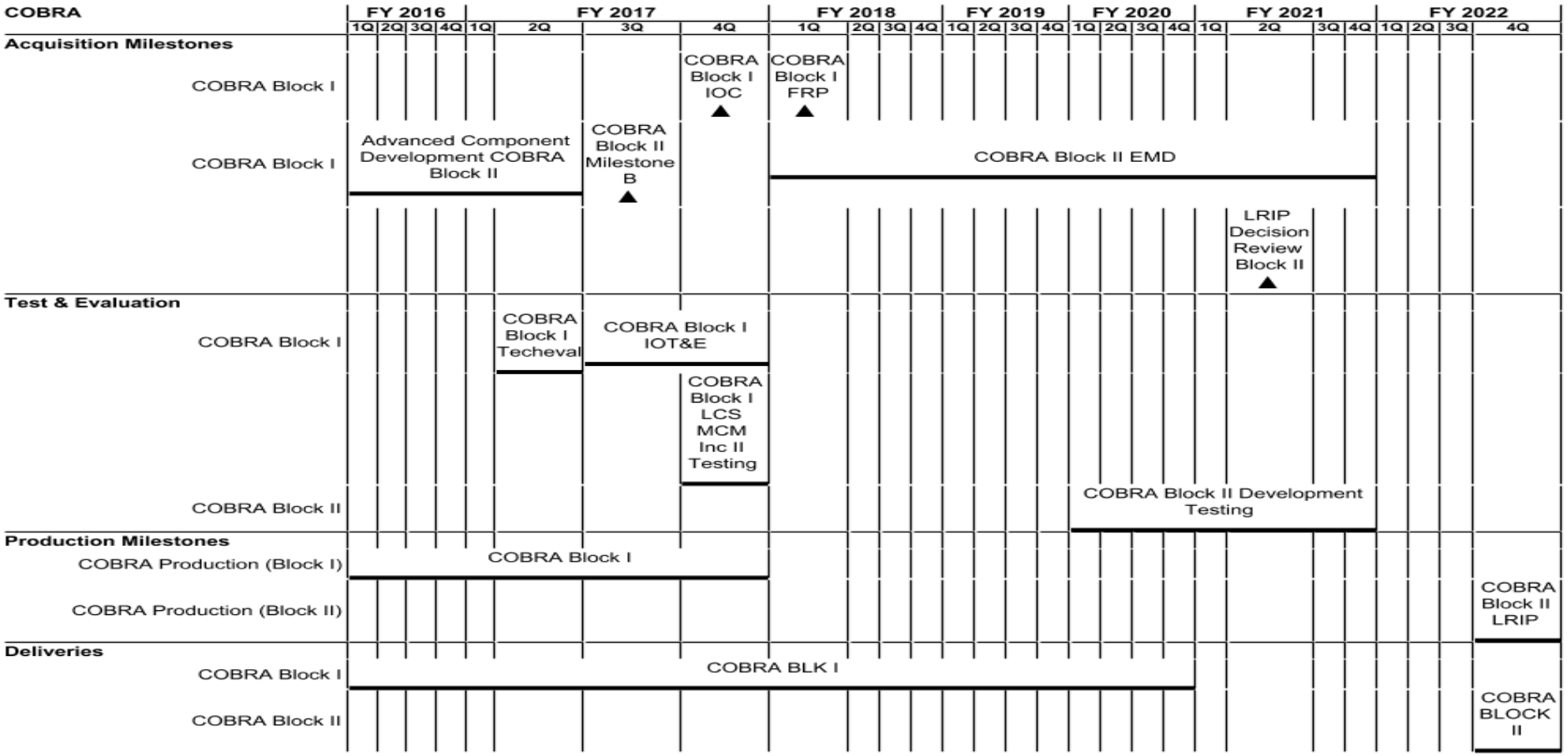
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	C/CPFF	BAH, NOrthrop Grumman : DC, FL	10.815	0.120	Feb 2016	0.125	Dec 2016	0.090	Dec 2017	-		0.090	0.000	11.150	-
Government Engineering Support	WR	NSWC, IH : INDIAN HEAD, MD	35.579	0.498	Nov 2015	0.509	May 2017	0.359	Nov 2017	-		0.359	0.000	36.945	-
Program Management Support	WR	NSWC/ IH, PC : INDIAN HEAD, PANAMA CITY	25.216	0.441	Nov 2015	0.451	Apr 2017	0.318	Nov 2017	-		0.318	0.000	26.426	-
Travel	WR	NAVSEA : WNY, DC	1.653	0.060	Nov 2015	0.050	Oct 2016	0.037	Oct 2017	-		0.037	0.000	1.800	-
Assessment/BTR	C/CPAF	VARIOUS : VARIOUS	1.434	0.000		0.000		0.000		-		0.000	0.000	1.434	-
Acquisition Workforce	Various	VARIOUS : VARIOUS	0.211	0.000		0.000		0.000		-		0.000	0.000	0.211	-
		Subtotal	74.908	1.119		1.135		0.804		-		0.804	0.000	77.966	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	595.138	15.097		20.201		11.623		-		11.623	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*



2018PB - 0603502N - 2131

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2131 / *Assault Breaching System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
COBRA				
Acquisition Milestones: COBRA Block I: COBRA Block I IOC	4	2017	4	2017
Acquisition Milestones: COBRA Block I: COBRA Block I FRP	1	2018	1	2018
Acquisition Milestones: COBRA Block I: Advanced Component Development Block II	1	2016	2	2017
Acquisition Milestones: COBRA Block I: COBRA Block II EMD	1	2018	4	2021
Acquisition Milestones: COBRA Block I: COBRA Block II Milestone B	3	2017	3	2017
Acquisition Milestones: COBRA Block I: LRIP Decision Review Block II	2	2021	2	2021
Test & Evaluation: COBRA Block I: COBRA Block I Techeval	2	2017	2	2017
Test & Evaluation: COBRA Block I: COBRA Block I IOT&E	3	2017	4	2017
Test & Evaluation: COBRA Block I: COBRA Block I LCS MCM Inc II Testing	4	2017	4	2017
Test & Evaluation: COBRA Block II: COBRA Block II Development Testing	1	2020	4	2021
Production Milestones: COBRA Production (Block I): COBRA Block I	1	2016	4	2017
Production Milestones: COBRA Production (Block II): COBRA Block II LRIP	4	2022	4	2022
Deliveries: COBRA Block I: Block I	1	2016	4	2020
Deliveries: COBRA Block II: Block II	4	2022	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 2989 / *Barracuda*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2989: *Barracuda*	0.000	0.000	0.000	20.761	-	20.761	33.678	34.769	34.124	39.951	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Barracuda is an expendable mine neutralizer that provides the only unmanned mine neutralization capability to address previously detected near surface mines. These capabilities provide positive identification and recognition of the sea mine threat, reduced mine neutralization mission timelines, and reduced cost to neutralize a mine relative to existing systems. Initial Barracuda deployment will be on the Unmanned Surface Vehicle (USV) as a part of the Mine Countermeasures (MCM) Mission Package (MP). Subsequent plans are to expand potential means of providing in-stride MCM capabilities. Barracuda may be hosted by a Littoral Combat Ship (LCS), Expeditionary Mobile Base (ESB), or shore facility. Barracuda baseline capability is derived from the single sortie detect to engage (SS-DTE) Future Naval Capabilities (FNC) effort. Barracuda addresses unmet requirements in near surface neutralization created the cancellation of the RAMICS program in FY13.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Barracuda: Product Development	0.000	0.000	16.008	0.000	16.008
Articles:	-	-	-	-	-
FY 2016 Accomplishments: N/A					
FY 2017 Plans: Reference PE 0604373N; Barracuda was moved to PE0603502N for FY18 - FY22.					
FY 2018 Base Plans: Complete Barracuda Source Selection and complete contract award. Conduct Barracuda Integrated Baseline Review (IBR) to confirm sufficient resource loading and establish a baseline to track Earned Value. Initiate detailed design of the system starting with conducting a System Requirements Review (SRR), verifying requirements traceability, and preparing for Preliminary Design Review (PDR), which will include component level prototyping and testing to demonstrate risk reduction within the design to be proposed.					
FY 2018 OCO Plans: N/A					
Title: Barracuda: Engineering Support	0.000	0.000	4.467	0.000	4.467
Articles:	-	-	-	-	-
FY 2016 Accomplishments:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A ***FY 2017 Plans:*** Reference PE 0604373N; Barracuda moved to PE0603502N for FY18 - FY22. ***FY 2018 Base Plans:*** Complete technical development of detailed design and complete source selection. ***FY 2018 OCO Plans:*** N/A					
Title: Barracuda: Management Services ***Articles:*** ***FY 2016 Accomplishments:*** N/A ***FY 2017 Plans:*** Reference PE 0604373N; Barracuda moved to PE0603502N for FY18 - FY22. ***FY 2018 Base Plans:*** Continue to provide program management, financial management, and engineering support. ***FY 2018 OCO Plans:*** N/A	0.000 -	0.000 -	0.286 -	0.000 -	0.286 -
Accomplishments/Planned Programs Subtotals	0.000	0.000	20.761	0.000	20.761

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• 0604373N/2473: *Airborne Mine Countermeasures*	0.000	7.610	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.610

Remarks

Barracuda FY17 funding in budget PE0604373N and moved to PE0603502N in FY18 - FY22.

D. Acquisition Strategy

Field the baseline system to address near surface portion of water column.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

E. Performance Metrics

Successful fielding of the Barracuda system.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Hardware/ Support	C/CPIF	TBD : TBD	0.000	0.000		0.000		16.008	May 2018	-		16.008	0.000	16.008	-
		Subtotal	0.000	0.000		0.000		16.008		-		16.008	0.000	16.008	-

Remarks

Reference PE0604373N for FY17

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Engineering Support	WR	NUWC NPT : Newport, RI	0.000	0.000		0.000		0.544	Dec 2017	-		0.544	Continuing	Continuing	Continuing
Barracuda Engineering Services	C/CPIF	JHU APL : Baltimore, MD	0.000	0.000		0.000		0.668	Dec 2017	-		0.668	Continuing	Continuing	Continuing
Barracuda Engineering Support	WR	NSWC, PC : Panama City, FL	0.000	0.000		0.000		1.241	Dec 2017	-		1.241	Continuing	Continuing	Continuing
Barracuda Support	WR	NSWC, IHD : Indian Head, MD	0.000	0.000		0.000		1.450	Dec 2017	-		1.450	0.000	1.450	-
Barracuda Support	WR	NSWC, PHD : Port Hueneme, CA	0.000	0.000		0.000		0.310	Dec 2017	-		0.310	0.000	0.310	-
Barracuda Support	WR	NSWC, Carderock : Bethesda, MD	0.000	0.000		0.000		0.254	Dec 2017	-		0.254	0.000	0.254	-
		Subtotal	0.000	0.000		0.000		4.467		-		4.467	-	-	-

Remarks

Reference PE0604373N for FY17

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Barracuda Management Support	WR	NSWC, PC : Panama City, FL	0.000	0.000		0.000		0.286	Dec 2017	-		0.286	0.000	0.286	-
		Subtotal	0.000	0.000		0.000		0.286		-		0.286	0.000	0.286	-

Remarks

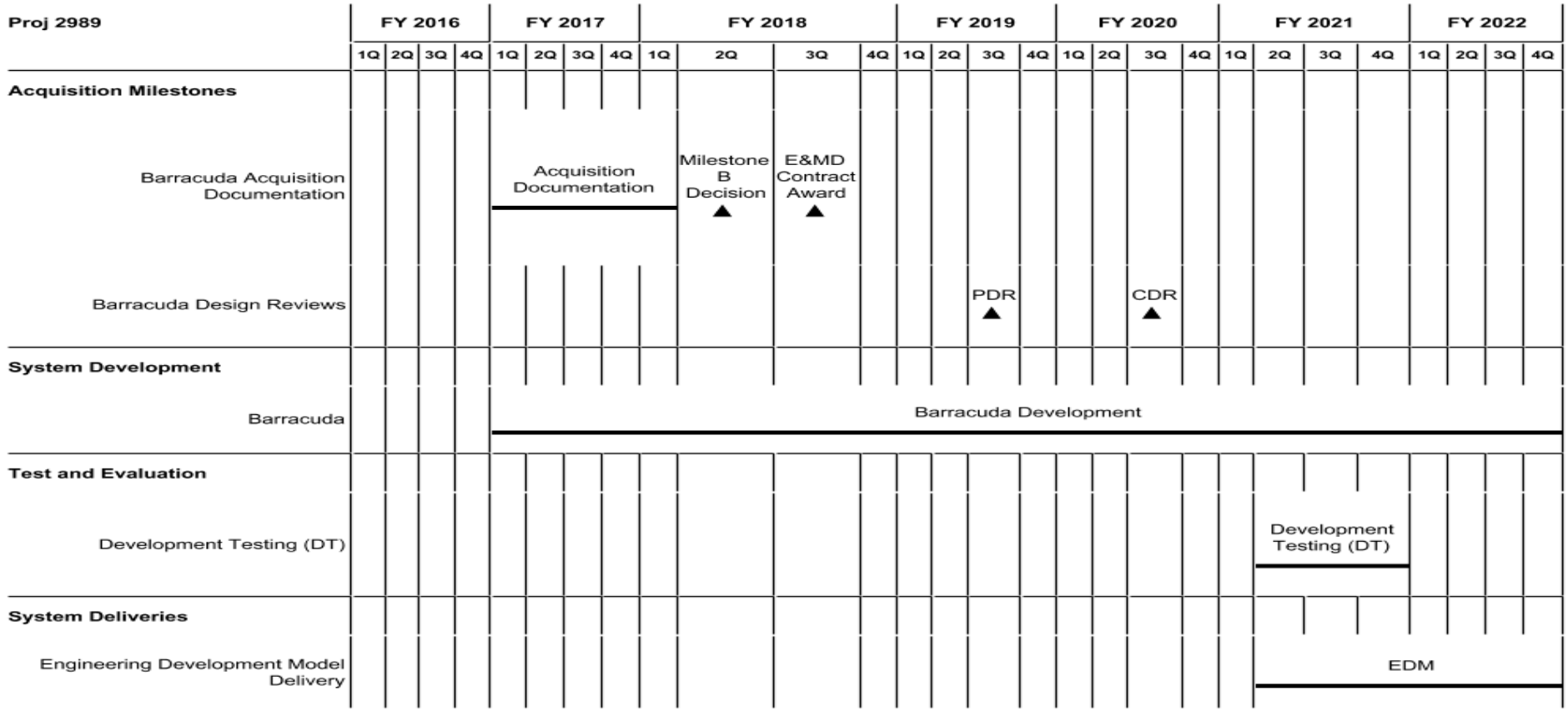
Reference PE0604373N for FY17

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		20.761		-		20.761	-	-	-

Remarks

Reference PE0604373N for FY17

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*



2018PB - 0603502N - 2989

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 2989 / *Barracuda*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2989				
Acquisition Milestones: Barracuda Acquisition Documentation: Acquisition Documentation	1	2017	1	2018
Acquisition Milestones: Barracuda Acquisition Documentation: Milestone B Decision	2	2018	2	2018
Acquisition Milestones: Barracuda Acquisition Documentation: Contract Award	3	2018	3	2018
Acquisition Milestones: Barracuda Design Reviews: Preliminary Design Review	3	2019	3	2019
Acquisition Milestones: Barracuda Design Reviews: Critical Design Review	3	2020	3	2020
System Development: Barracuda: Barracuda Development	1	2017	4	2022
Test and Evaluation: Development Testing (DT): Development Testing (DT): Development Testing (DT)	2	2021	4	2021
System Deliveries: Engineering Development Model Delivery: Engineering Development Model Delivery	2	2021	4	2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3123 / *SMCM UUV*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
3123: *SMCM UUV*	120.607	14.923	11.557	25.052	-	25.052	16.717	20.747	21.598	22.031	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Knifefish Surface Mine Countermeasure Unmanned Undersea Vehicle (SMCM UUV) program develops new, advanced Unmanned Undersea Vehicles (UUVs) to support clandestine mine detection capability against volume, bottom, and buried mines. Equipment includes vehicles and associated systems support equipment. In parallel, Pre-Planned Product Improvement(P3I) design efforts are ongoing to support insertion of incremental capability when the technology is ready. Potential P3I candidates being considered include increased detection range capability, communications upgrades, on-board sonar processing and target recognition, command and control improvements, and other smaller tasks.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Knifefish SMCM UUV	14.923	11.557	25.052	0.000	25.052
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued Engineering and Manufacturing Development (E&MD) phase. Completed initial contractor testing. Started preparation of Milestone C documentation.					
FY 2017 Plans: Continue Contractor Testing (CT) and start initial Developmental Testing (DT). Conduct Engineering Qualification Testing (EQT) and initial risk reduction Launch and Recovery (L&R) testing off of an LCS ship provided ship schedules support.					
FY 2018 Base Plans: Complete CT and conduct Developmental Testing (DT)/Operational Assessment (OA). Achieve Milestone C in 2QFY18 and award initial LRIP contract.. Conduct Pre-Planned Product Improvement (P3I) development efforts to increase sonar range by 3x and lay foundation for additional follow-on P3I efforts (onboard processing, re-acquisition, dual-side sonar, and increased endurance). Component fabrication, testing, and initial integration of Pre-Planned Product Improvement (P3I) efforts to increase sonar range.					
FY 2018 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	14.923	11.557	25.052	0.000	25.052

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• OPN/2622: *Minesweeping Replacement*	21.014	56.675	31.531	-	31.531	45.174	43.084	42.517	43.092	Continuing	Continuing
• OPN/1601: *Enter Other Funding Description.*	67.451	57.146	55.870	-	55.870	73.903	75.373	158.293	188.844	1,406.438	2,165.302

Remarks

Funding displayed on BLIs 2622 and 1601 OPN in total, does not reflect Knifefish OPN dollars.

D. Acquisition Strategy

The Knifefish program was initiated in FY11 to develop Surface Mine Countermeasure Unmanned Undersea Vehicles (SMCM UUV) equipped with advanced Low Frequency Broadband (LFBB) sonar that provides volume, bottom, and buried mine detection capability. Initial procurement of the SMCM UUV with LFBB begins in FY 2018 after Milestone C with additional procurements in subsequent years.

E. Performance Metrics

Successful Milestone C in 2Q FY 2018.
Reach Initial Operational Capability (IOC) 2Q FY19. Full Rate Production Decision would then follow in 4Q FY19.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603502N / *Surface & Shallow Water MCM*	Project (Number/Name) 3123 / *SMCM UUV*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SMCM UOES Development	C/CPAF	BLUEFIN : CAMBRIDGE, MA	15.142	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Knifefish Development	C/CPIF	Various : Various	17.497	0.000		0.000		0.000		-		0.000	0.000	17.497	-
Knifefish Development	C/CPIF	General Dynamics AIS : McLeansville, NC	58.259	8.865	Dec 2015	7.783	Dec 2016	8.134	Dec 2017	-		8.134	Continuing	Continuing	Continuing
Hardware/Software Development - Support Equipment	WR	NSWC, PC : PANAMA CITY, FL	0.805	1.624	Apr 2016	0.000		0.750	Dec 2017	-		0.750	Continuing	Continuing	Continuing
Knifefish P3I Initial Development Contractor	C/CPIF	GDMS : McLeansville, NC	0.000	0.000		0.000		6.408	Dec 2017	-		6.408	0.000	6.408	-
		Subtotal	91.703	10.489		7.783		15.292		-		15.292	-	-	-

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Support	WR	NSWC, PC : PANAMA CITY, FL	14.837	1.932	Dec 2015	1.000	Dec 2016	1.000	Dec 2017	-		1.000	Continuing	Continuing	Continuing
Engineering Support	WR	NUWC, Newport : NEWPORT, RI	4.926	0.802	Dec 2015	0.490	Dec 2016	0.400	Dec 2017	-		0.400	Continuing	Continuing	Continuing
Engineering Support	WR	VARIOUS : VARIOUS	3.699	0.780	Dec 2015	0.940	Dec 2016	1.000	Dec 2017	-		1.000	Continuing	Continuing	Continuing
Engineering Support P3I	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.000		0.000		0.500	Dec 2017	-		0.500	0.000	0.500	-
Engineering Support P3I	WR	NUWC, Newport : NEWPORT, RI	0.000	0.000		0.000		0.250	Dec 2017	-		0.250	0.000	0.250	-
Engineering Support P3I	WR	VARIOUS : VARIOUS	0.000	0.000		0.000		3.800	Dec 2017	-		3.800	0.000	3.800	-
		Subtotal	23.462	3.514		2.430		6.950		-		6.950	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NOMWC : STENNIS, MS	0.526	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Government T&E Support	WR	VARIOUS : VARIOUS	1.213	0.116	Jan 2016	0.150	Jun 2017	0.920	Dec 2017	-		0.920	Continuing	Continuing	Continuing
Test and Evaluation	WR	COMOPTEVFOR : NORFOLK, VA	0.481	0.075	Dec 2015	0.000		0.160	Dec 2017	-		0.160	Continuing	Continuing	Continuing
Government T&E Support	WR	NSWC, PC : PANAMA CITY, FL	0.000	0.449	Dec 2015	0.400	Apr 2017	0.500	Dec 2017	-		0.500	0.000	1.349	-
		Subtotal	2.220	0.640		0.550		1.580		-		1.580	-	-	-

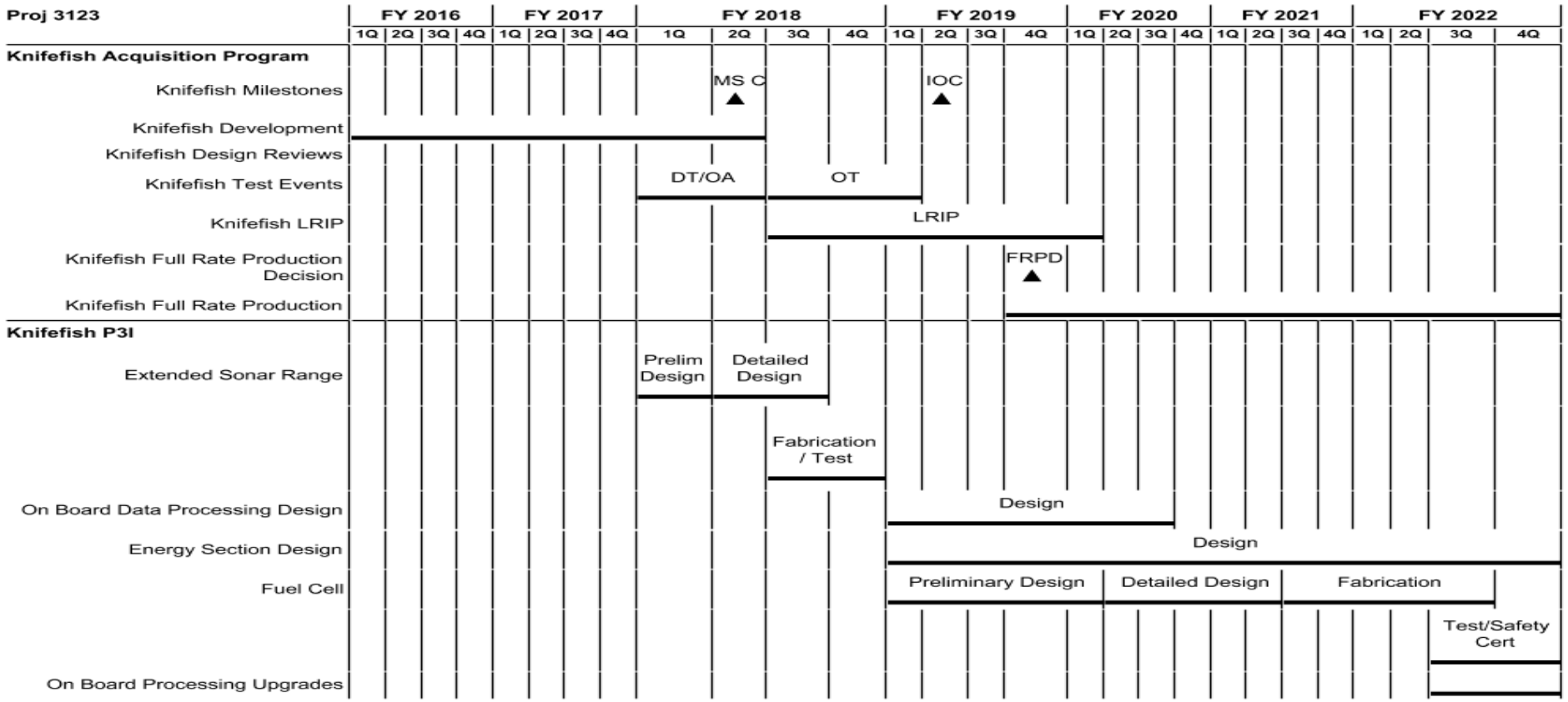
Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPFF	VARIOUS : WASHINGTON, DC	2.890	0.230	Dec 2015	0.744	Dec 2016	1.105	Feb 2018	-		1.105	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : WNY, DC	0.285	0.050	Dec 2015	0.050	Dec 2016	0.125	Dec 2017	-		0.125	Continuing	Continuing	Continuing
Acquisition Workforce	WR	VARIOUS : VARIOUS	0.047	0.000		0.000		0.000		-		0.000	0.000	0.047	-
		Subtotal	3.222	0.280		0.794		1.230		-		1.230	-	-	-

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	120.607	14.923		11.557		25.052		-		25.052	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*



2018PB - 0603502N - 3123

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603502N / *Surface & Shallow Water MCM*	**Project (Number/Name)** 3123 / *SMCM UUV*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3123				
Knifefish Acquisition Program: Knifefish Milestones: Milestone C	2	2018	2	2018
Knifefish Acquisition Program: Knifefish Milestones: IOC	2	2019	2	2019
Knifefish Acquisition Program: Knifefish Development:	1	2016	2	2018
Knifefish Acquisition Program: Knifefish Test Events: DT/OA	1	2018	2	2018
Knifefish Acquisition Program: Knifefish Test Events: OT	3	2018	1	2019
Knifefish Acquisition Program: Knifefish LRIP:	3	2018	1	2020
Knifefish Acquisition Program: Knifefish Full Rate Production Decision:	4	2019	4	2019
Knifefish Acquisition Program: Knifefish Full Rate Production:	4	2019	4	2022
Knifefish P3I: Extended Sonar Range: Extended Range Prelim Design	1	2018	1	2018
Knifefish P3I: Extended Sonar Range: Extended Range Detailed Design	2	2018	3	2018
Knifefish P3I: Extended Sonar Range: Extended Range Fabrication/Test	3	2018	4	2018
Knifefish P3I: On Board Data Processing Design:	1	2019	3	2020
Knifefish P3I: Energy Section Design: Energy Section Design	1	2019	4	2022
Knifefish P3I: Fuel Cell: Fuel Cell Prelim Design	1	2019	1	2020
Knifefish P3I: Fuel Cell: Fuel Cell Detailed Design	2	2020	2	2021
Knifefish P3I: Fuel Cell: Fuel Cell Fabrication	3	2021	3	2022
Knifefish P3I: Fuel Cell: Fuel Cell Test/Safety Cert	3	2022	4	2022
Knifefish P3I: On Board Processing Upgrades: Upgrades	3	2022	4	2022